The EnviroMon System User Manual R5.06

General Information

EnviroMon for Windows software

Software drivers

Technical information

Chapter 1: Introduction

Introduction

This user manual contains nearly two hundred pages of online information, providing comprehensive information about all aspects of the EnviroMon system.

Please take a few minutes to read this introduction, as this will give you a brief overview of how the system works, and where to find additional information.

The System

The EnviroMon system is designed for long-term recording of data from a number of locations.

The system offers the following features:
- permanent retention of recorded data on PC
- wide range of data display and analysis options
- easy-to-use software
- telephone style connections for easy installation
- modular system for easy upgrades
- a wide range of options to report alarm conditions
- support for remote data download (modem, GSM, IP, etc)

The Equipment

The main components of an EnviroMon system are:
- a computer
- a logger
- a number of converters
- alarm options

The computer performs the following functions, using the EnviroMon for Windows program:
- configuring the system
- long-term storage of data
- display, print and analysis of recorded data

The computer talks to loggers using one of the following methods:
- using a direct connection to a local logger
- via a telephone modem - to a logger on a remote site
- using a radio link - for short-range connection to sites not serviced by telephone
- via a GSM telephone - for remote or mobile applications
- via an IP network - ideal for companies that already have a computer network

The logger stores data continuously, even when the computer is turned off or disconnected, or the mains fails.

The logger connects to a number of converters that take measurements. The converters can be up to 400 metres away from the logger, and are connected using a single, low-cost, telephone cable that forms a 'network' between the logger and the converters.

The Software

EnviroMon for Windows is used both to configure an EnviroMon system, and to extract and analyse data from the system.

To run EnviroMon for Windows under Windows 95:
- Press the Start button
- Select Programs
- Select Pico Technology
- Select EnviroMon for Windows

When you first start up the EnviroMon software, the system is not yet configured, so the computer displays the configuration panel.
The top button on the configuration panel selects a guided tour: this will take you, step by step, through the process of setting up a simple system.
The final stage of configuring a system is to press the **Program** button: this writes a configuration to the logger.

When you start up the EnviroMon software after the system has been configured, the software transfers the readings stored in the logger to a data file on your computer, and then displays the Monitor view which shows the current value of each measured parameter.
From the monitor view, you can use the menu to get back to the configuration panel, or to any of the reporting views.
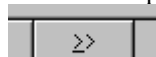
Online Help

Each dialog or view in EnviroMon for Windows has a link to the corresponding information in this help file.
- to get help from a dialog, press the **Help** button
- to get help from a view, press the [?] button

Once in this help file, you can find things in several ways:
- press the **Contents** button for a full list of the items covered in this file
- press **Index** and then specify a keyword that describes what you are looking for
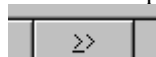
- press the [>>] button to move on to the next topic
- press an underlined area to link to a related topic

Legal info

Licensing
Both the demonstration and production versions of Enviromon for Windows may be copied and used freely on any number of computers.

Liability
Pico Technology Limited does not accept responsibility for any loss or injury caused by the use of Pico Technology equipment or software. It is the user's responsibility to ensure that the product is suitable for the user's application.

Trade marks
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Chapter 2: Configuration

Configuration planning
   Who will be responsible for the system?
   What do you want to measure?
   What action is required on alarms?
   What should happen on power failure?
   Data storage and reporting
   Where should equipment be placed?
   How to validate the system
   Security

Configuration planning

EnviroMon is a very flexible system. It is made up of a number of separate modules: you simply choose the modules that you need to do the job. In addition, there are several software options that can be configured so that the logger will do exactly what you want.

This section describes the points that you should consider when setting up an EnviroMon system.

- Who will be responsible for the system?
- What do you want to measure?
- What action is required on alarms?
- What should happen on power failure?
- Data storage and reporting
- Where should equipment be placed?
- How to validate the system
- Security

Who will be responsible for the system?

For a small configuration, one person can easily install the system and operate it on a day-to-day basis.

Larger systems are often installed by external contractors, but it is essential to have someone within the company who will be responsible for maintaining the
system once it is installed. This person should be involved at the earliest stages in the planning of the system, so that they understand how it works and can easily make small changes to the system as requirements change.

What do you want to measure?

EnviroMon takes readings from a number of sensors distributed around a site. These sensors are connected to converters that transform the analogue signals from the sensor into digital signals: these digital signals can then be transmitted reliably and accurately to the logger. The type of sensor and converter depends on what you wish to measure.

Temperature

EnviroMon provides full support for three different temperature measuring techniques: it can also work with other techniques if required.

- **Precision thermistors** are relatively low cost and they are highly accurate (0.1°C) , but only over a relatively limited temperature range, for example -40 to 30°C or 0 to 70°C.

- **Pt100 platinum resistance (PRT) sensors** cover a wider temperature range- -200 to 650°C- and are available in DIN standard (0.3°C), tenth-DIN (0.03°C) and even higher accuracies.

- **Type K thermocouples** work over a range -270 to 1370°C: they are available in a wide variety of probes from a large number of suppliers. There is a standard connector, so thermocouples from different suppliers are interchangeable. Typical accuracy is 0.5°C at ambient temperature, and error increases as the temperature goes away from ambient.

Thermistors

The standard EL015 and EL039 EnviroMon temperature sensors are precision thermistors sealed in a stainless steel cylinder. The sensor is fitted with a 5-metre cable and a connector which plugs straight into an EL001 temperature converter. Each EL001 can accept three sensor inputs. The sensor cable can be extended to a maximum of about 100 metres: this will introduce an error of less than 0.1C in the temperature measurement.

At temperatures below 0C, the cable may become brittle, and must not be flexed. At temperatures over 70C, the cable may become soft and easily damaged.

The EL015 and EL039 temperature sensors have an accuracy of 0.1C over 0 to 30C, and 0.2C over -20 to 50C. Outside this range, we recommend the use of Pt100 or Type K sensors.

For localised temperature measurement- for example, measuring the temperature of a critical component in a control system- Pico can also supply thermistor sensors as bare beads, approx 1mm diameter.

Type K thermocouples

The CM004 Type K thermocouple conditioner supports the full temperature range for type K. It is fitted with a standard miniature thermocouple connector.

Pt100 platinum resistance

The CM005 Pt100 conditioner covers the range -200 to 350C. It has four screw-terminal connectors, and can be used with two, three or four-wire sensors.

Humidity

EnviroMon can measure humidity using the EL031 temperature and humidity sensor and EL026 converter. The converter contains calibration information for the sensor, so the units are supplied as a pair. The EL031 contains both a temperature sensor and a humidity sensor. The humidity sensor has a calibrated accuracy of 2%.

Light

The EL031 light sensor is intended to provide a qualitative measure of light level. It connects to one of the channels of an EL001 converter. The sensor gives a log-scaled reading between 0 an 100%, where 0 is complete darkness and 100 is full sunlight. For more accurate light measurement, see measurement made easy.

Door open/closed

The EL029 door switch can be connected to one of the channels of an EL001 converter. The logger reports whether the door is open or closed, and any statistics show the percentage of time the door was open during any period.

Other parameters

There are three general-purpose converters for use with the EnviroMon system.
- EL016 8-channel voltage converter
- EL036 2-channel signal conditioner converter
- EL037 3-channel voltage/4-20mA converter

The EL016 has eight inputs that can measure signals between 0 and 2.5 volts. EnviroMon can be programmed to convert the voltages into some other units (for example, pressure) and display them in those units.

The EL036 accepts two signal conditioner modules, for example the CM004 Pt100 conditioner described above. There is a wide range of signal conditioning modules that are tailored to work with specific sensors, and also general purpose conditioners to work with 4-20mA or 0-5V transmitters. See Measurement made easy for more details of signal conditioners.

The EL037 has three inputs that can be configured to measure ±2.5Volts, ±10Volts and 4-20mA. EnviroMon can be programmed to convert the measurements into some other units (for example, pressure) and display them in those units.

Bear in mind when selecting sensors that EnviroMon is a low-power system, hence it can carry on running when mains fails. Where possible, select low-power sensors. If it is essential to use a sensor that requires a lot of power (for example gas sensors), you should consider either providing a local power supply for the EL036 that it is connected to, or using the El018 battery backup unit.

What action is required on alarms

EnviroMon can be configured to sound an alarm if a temperature goes out of range (high or low) or if a sensor fails.

For many applications, it is not necessary to have alarms for all sensors, so the alarm function for any sensor can be disabled. It is also possible to enable the alarm only during certain time ranges, for example during working hours (eg 9 to 5, Monday to Friday).

It may be desirable to have an alarm on sensor failure, but not on temperature out of range. This can be done by leaving the alarm enabled and setting a wide temperature range.

If the temperature normally goes out of range for short periods, it is possible to hold off (delay) alarms for a specified period. For example, if a freezer periodically goes through a defrost cycle lasting 15 minutes, an alarm holdoff of 20 minutes would prevent the defrost cycle from causing alarms.

The high and low threshold, disable and holdoff can be set individually for each sensor.

The logger contains a built-in audible alarm: if the area where the logger is mounted is continuously manned, the built-in alarm is sufficient.

If the logger area is not continuously manned, it may be necessary to use a remote audible alarm, either in the workarea or in a security control room. This can be linked to the logger using the network cable.

If it is necessary to respond to alarms when the site is unmanned, the alarm dialer module can make telephone calls to several numbers and deliver a voice message.

What should happen on power failure

For some applications, it is not necessary to collect or store data if mains power fails.

If continuous operation during mains failure is required, there are two options:

- fit 4xAA batteries into the logger. This provides several hour's backup, but the batteries must be changed from time to time
- install an EL018 dialer/battery backup module: this contains a lead-acid battery that will give 24 hours' operation in the event of mains failure. It is continuously kept charged while mains power is present.

Data storage and Reporting

Data storage and reporting requirements vary enormously, depending on the application. There are three main options:
- monitor temperatures - use the logger only for immediate temperature monitoring and alarms
- print out reports at regular intervals, directly from the logger
- store the data on computer

The logger can be connected to either a tally roll printer or to an Epson A4-paper printer. It can print the current temperatures, and can also print out a periodic summary which shows the minimum, maximum and average readings, together with the number of alarms and the total alarm duration. This approach is useful if there is not space for a computer, or if staff are not familiar with computers. These reports can be printed out either at regular intervals, or on request.

If a computer is used, data is transferred to the computer automatically each time the user runs the EnviroMon program on the computer. Storing data on the computer has a number of advantages:
- data can easily be backed up for added security
- if the computer already has access to a printer, it is not necessary to buy a separate printer for the logger
- the computer software offers a wider range of report formats
- it is possible to transfer data to other applications for further analysis
- the computer need not be on the same site as the logger (see remote data access)

Once data is stored on the computer, it can be processed in a number of ways:
- a spreadsheet-style display, which can be transferred to a spreadsheet for further analysis
- a graph of readings against time, over periods from hours to years
- a period summary which shows the minimum, maximum and average reading for each sensor during the period, together with the number of alarm events and the total alarm duration.
- a list of alarm events: it is possible to add notes about action taken on alarm.

It is possible to specify a backup path for files: this can either be a diskette or a network drive. If you specify a diskette, the backup should be done manually, using the backup option on the file menu. If you specify a network drive, you can also request an automatic backup each time you exit from the program.

It is also possible to specify that old files should be deleted after a period of time: the options are
- never
- delete after a month
- delete after a quarter
- delete after a year

If you are collecting data every minute, this will require about 1.6Megabytes per year. Most computers have at least 1000 Megabytes of disk space, so it is not usually necessary to delete old data.

Remote data collection

It is possible to access logger data remotely using either a radio modem or a telephone modem.

Radio modem

One computer can maintain radio modem links to several remote loggers. Because EnviroMon requires very little power, the remote loggers can easily operate using a battery that is kept charged using a solar panel. The logger has built-in power saving features to turn off the radio modem when it is not required.

Telephone modem

The EnviroMon software running on a PC can use a modem to make a telephone call to a remote logger, then extract data from the logger and terminate the connection.

The logger can be configured to permit the modem to answer telephone calls only during a narrow time range. This means, for example, that the logger data can be downloaded at night using a telephone line that is allocated for other uses during the day.

Where should equipment be placed?

Each EnviroMon converter turns sensor inputs into digital signals: these digital signals can be transmitted quite long distances through the network cable. Converters should be a maximum of 400 metres from the logger.

The logger can therefore be placed wherever information is required, for example in an office area, and the converters can be placed near where parameters are to be measured.

Thermistor sensors are supplied with a 5-metre cable that can be extended up to 100 metres.

Alarm relay and dialer modules are best placed close to the logger, to minimise the risk that a break in the network could prevent the logger from operating the relay or dialer.

Security

It is not possible to change the logger configuration from the logger keypad: it is necessary to use a computer.

The EnviroMon for Windows software normally allows full access to both the data display and configuration functions. If, however, you enter details of users, you can specify which users are allowed to access the configuration menu.

How to validate the system

It will be necessary to check that all parts of the system work- this is essential once the system is installed, and should be repeated at least yearly thereafter.

We recommend that you create a checklist of features to test, while you are deciding what the configuration will be, then you can use this checklist once the system is installed. See the sections on Maintenance and Calibration for some ideas on testing.

If possible, you should operate the system for a period of time to ensure that it is working correctly, before you start to rely on the results.

When deciding on tests, the test is as lifelike and as complete as possible. For example, if you are using a dialer, you should simulate a fault, then verify that the logger activates that dialer, the dialer calls the correct telephone numbers, and the persons called understand how to acknowledge the call.

Chapter 3: Equipment

General

Sensors

Converters

Logger

Alarm devices

Connectors

It is very easy to set up a small system, all of the parts connect together using FCC68 (telephone style) connectors.

To prevent incorrect assembly, two different types of connector are used:
- network cables use a wide connector that has six slots and four pins- the outer two slots are unused. (CO018)
- sensor cables use a narrow connector that has four pins in four slots. (CO017)
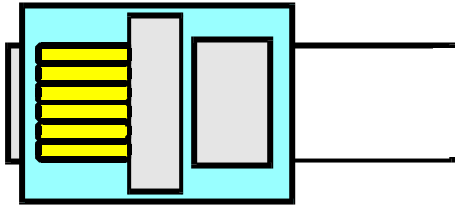
CM018 Network   CM017 Sensor

Network

The network is a four-wire cable which carries power and data between the logger, converters and optional equipment such as remote alarms. The logger can be attached anywhere along the network cable.

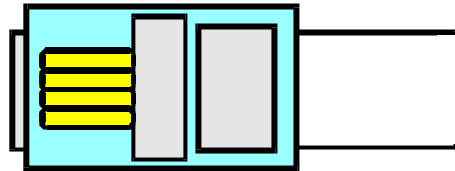The network will operate correctly with about 400 metres of standard network cable between the logger and the furthest converter: this distance can be increased to a kilometre or more using thicker cable.

The network can be built in four ways:

- connect each converter to the next using EL003 network cables. Each cable is 5 metres long, so the units must be within five metres of each other.

- make up longer versions of the network cable, then connect each converter to the next using these cables (you will need a crimp tool- available from Pico - to attach the plugs to the cables)

- install a fixed cable around the site with an EL009 telephone wall-socket at each point where a converter or logger is to be installed, then connect the logger and converters to the wall-sockets using 5-metre EL003 network cables

- install a fixed cable directly between converters. This is necessary when devices are fitted with screw terminal blocks ie. alarm relay, dialler, network junction box or the IP65 converter for use in wet environments.   In the case of the IP65 converter, the network and sensor cables enter the enclosure through IP65 cable glands, they are then attached to the converter using screw terminal blocks The logger is connected to the network cable using an EL009 wall-socket.

Small network

For small networks- where all converters are within a 5 metres of each other- it is possible to put together a network using only standard network cables.

The logger and converters each have two network sockets. By connecting a network cable from one unit to the next you can build up a complete network.

EL003 cable

EL001
Converters

EL008
Logger
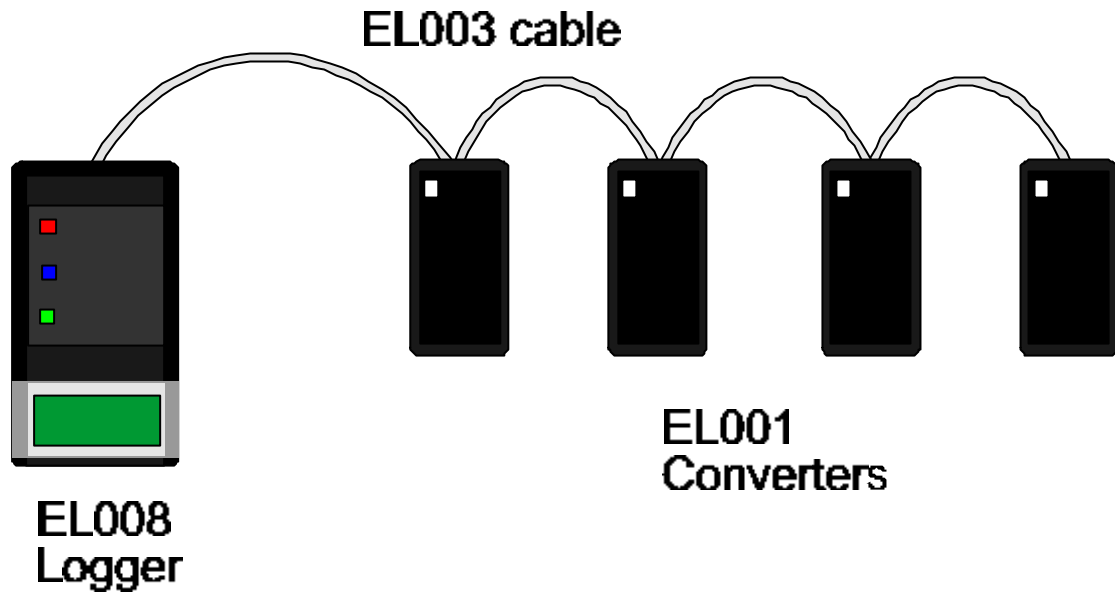
Larger network

For larger networks, the same approach may be used. The network cables must be made up onsite to the length required, using cable WI001 and connecting the CO018 connectors to the cable using a crimp tool.

In some circumstances it might be more convenient to use a spur cable to link some of the connectors. The network junction box (EL021) can be used to add spurs to the network.

EL008
Logger

EL021 Network
junction box

EL001
Converters

EL001
Converter
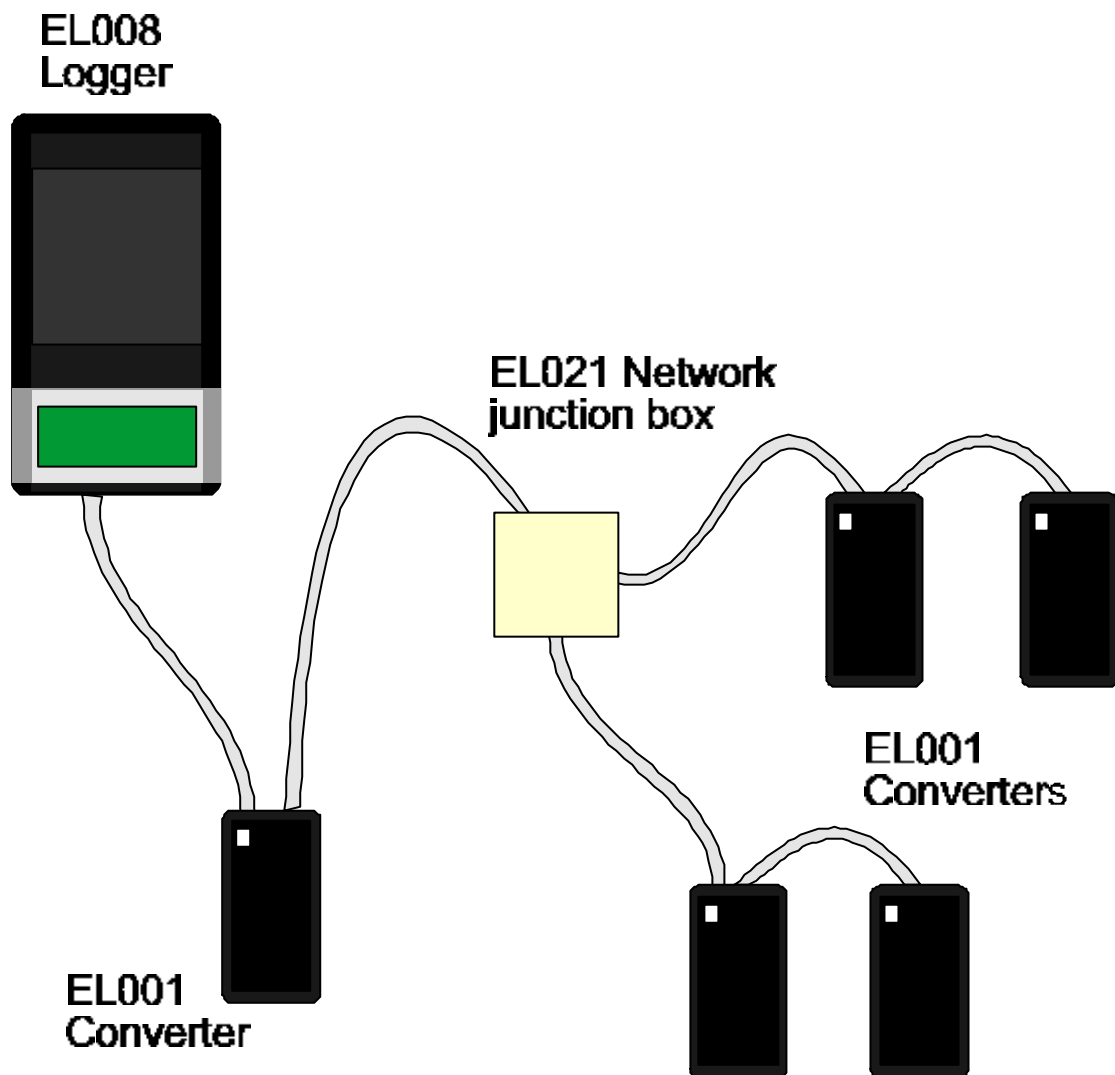
Fixed network

For the largest networks, ie a large number of converters or converters which are widely spaced, the most satisfactory installation is a fixed network. Place an EL009 wall-socket or EL021 network junction box at each location where a converter or logger is required and use a standard 5-metre cable to connect the socket to the logger or converter.
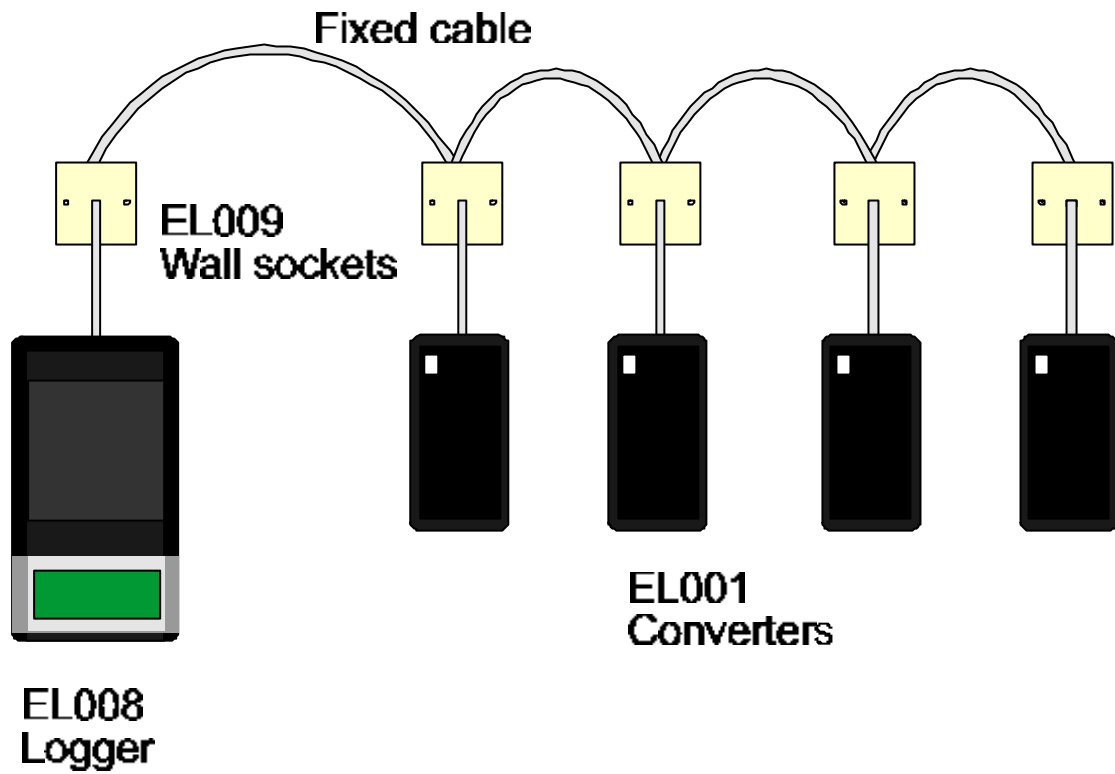
Screw terminal connections

The following EnviroMon devices are fitted with screw terminal blocks:

- EL011   Alarm Relay
- EL017   IP65 Converter
- EL018   Dialer/Battery Backup Unit
- EL021   Network Junction Box

The screw terminal block connects the device to the network instead of using the telephone sockets. The following diagram shows the connections linking the device to an EL009 wall socket:
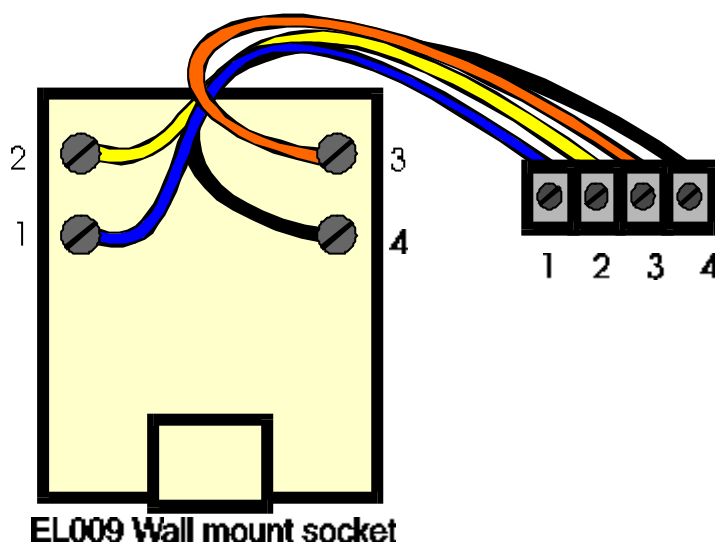

EL009 Wall mount socket

You should connect adjacent units using four core cable, eg Pico WI003. Connect terminal 1 to terminal 1, terminal 2 to terminal 2, et cetera. The following table shows the signals associated with each connection:

Connection	Signal
1	Data A
2	Data B
3	Power (12-18V)
4	Ground

Temperature Sensors

A sensor is required at each location where you wish to measure temperatures.

EL015/EL029 Temperature Sensors

The sensor is a steel tube about 5cm long. It has a 5-metre cable and there is a sensor connector at the other end of the cable. The sensor should be located where you wish to measure the temperature, eg in a refrigerator, tank or room.   The connector fits into one of the three sensor sockets on a converter.

The sensors can be attached either directly to the converter, or using an extension cable up to 100 metres long. The sensor adapter EL020 provides an easy way of extending sensor cables.   The standard sensor extension cable (EL032) is 5 metres long.

Standard sensor cables are not flexible at low temperatures: if it is necessary to move the cables, they should be warmed up before flexing.

EL031 Light Sensor

The EL031 Light Sensor connects to a standard temperature converter (EL001) using the supplied sensor extension cable.

The EL031 is intended to give a qualitative measure of light intensity. It has a logarithmic response, so it is useful at a wide range of light levels. It responds both to visible and to infra-red light.

When the logger is configured for use with a light sensor, the display on the logger reports a value between 0 and 100%. 0% means complete darkness: 100% means full sunlight. Repeatability between units is ±5%. If you require accurate (rather than qualitative) measurements or a specified range of wavelengths, and can identify a suitable voltage-output sensor, you can use it with the EL016 or EL036 converters.

The EL031 is designed to work with logger version 13 and above. If, when you power on the logger, it reports a logger version of 12, please contact Pico Technology Ltd.

The light sensor module can be attached to a wall using either adhesive foam or by removing the cover and using two screws to attach the unit to the wall.

EL029 Door Switch

The EL029 door switch connects to a standard temperature converter (EL001) using the supplied sensor extension cable.   When the logger is configured for use with a door switch, the display on the logger reports either 'Open' or 'Closed'.

Graphs and summary reports show the percentage of each sampling period that the door is open: 0% means permanently closed, and 100% means permanently open.

The EL029 is designed to work with logger version 13 and above. If, when you power on the logger, it reports a logger version 12, please contact Pico Technology.

The door switch module contains a built-in reed switch which can be activated using a magnet attached to the door.   Alternatively, if it is not practical to mount the door switch for operation with a magnet, an external micro-switch can be wired to the screw terminals inside the door switch module.

The door switch module can be attached to the wall using either adhesive foam, or by removing the cover and using two screws to attach the unit to the wall.
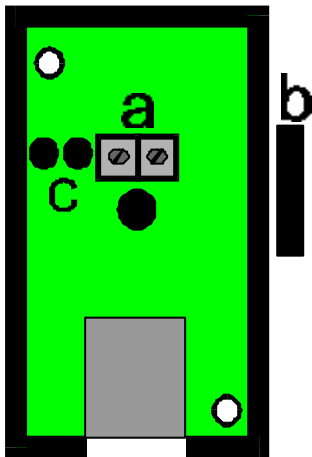
The black bar labelled b is the ideal location to place a magnet to activate the internal reed switch.

To attach an external microswitch make a hole in the case, insert the cable through the hole and strap the cable round the central pillar.   Attach the wires to connectors marked a.

For additional security, use a Tyrap to attach the cable to the two holes marked c on the left of the connector block.

Sensor connections

If you need to connect standard sensors directly to an IP65 converter, or flexible cable sensors to standard converters proceed as follows:

To connect the standard sensor to the IP65converter:
- hold the cable vertically with the plug upwards with the clip side toward you
- cut off the sensor connector
- remove the two right-hand side wires
- use the two left hand side wires (normally red and blue)

To connect flexible cable sensors to standard converters you will need to attach a sensor connector to a length of 4 core flat cable then connect the two wires from the sensor to the left hand two wires on the length of 4 core cable.
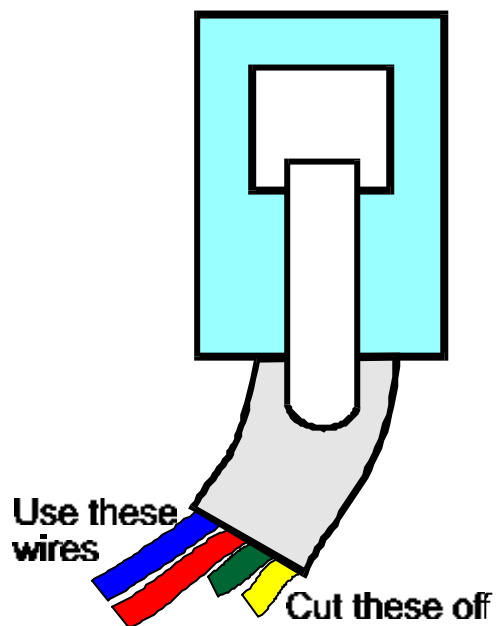
EL020 sensor adapter

The EL020 sensor adaptor has two sensor sockets, back to back. If it is necessary to extend a sensor cable, it is easy to do this by making up a cable of the required length with plugs at each end, then using the EL020 to attach one end of this cable to the sensor cable.

C0017/WI001 Extension
(up to 100 metres)

EL020 Sensor adaptor

EL015 Sensor
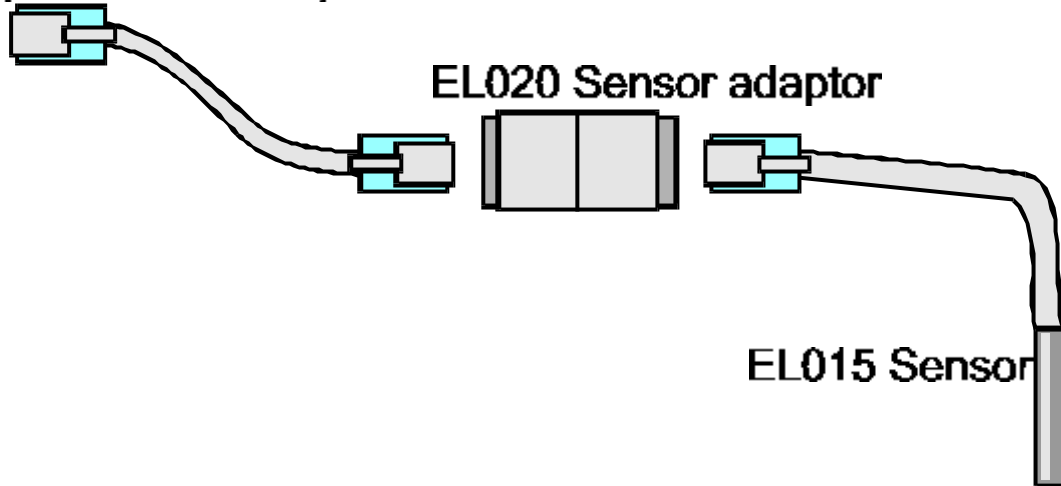
Converters

The converter is the means by which the sensor signal is converted to a number which is then sent to the logger.

Each converter has an address, which identifies it to the logger. Most converters are supplied with the address set to 1: The Change converter Address program can be used to change the address.

You can have up to 10 converters for each system using a mix of standard, IP65, humidity or voltage converters.

EL001 Temperature converter

The standard converter is a small black box. There are three narrow sockets at one end: these are for sensors. At the other end, there are two wide sockets for the network, and a red light (LED).

The red light flashes continuously immediately after the system is turned on. Once the system is running normally, the light goes out and, thereafter, flashes briefly each time the converter takes a reading.

Each converter has an 'address'- a number between 1 and 15 - written on the top right hand corner. Each converter on the network must have a different address which relates to its position on the network The converter will already be programmed with an address but you can change this through the installation software. The three sockets are marked with channel numbers.

When you install the system, the logging software will ask you for the address number and where each of the three sensors are which relate to that converter address. For large networks, it is best to make a plan of the layout before starting installation.

Standard converters are not waterproof: if you wish to place converters in an environment where they will be exposed to moisture, you should use an IP65 converter.

EL017 IP65 Temperature converter

The IP65 converter is identical to the standard converter, but is housed in an IP65 case: the IP rating is a measure of its resistance to water and dust.

The case is fitted with five cable glands: the cable glands are for two network cables (in and out) and three sensor cables. The unit is supplied with stoppers in each cable gland: the stoppers can be left in place to seal unused cable glands.

The cables are connected to screw terminals, as indicated in the following diagram.
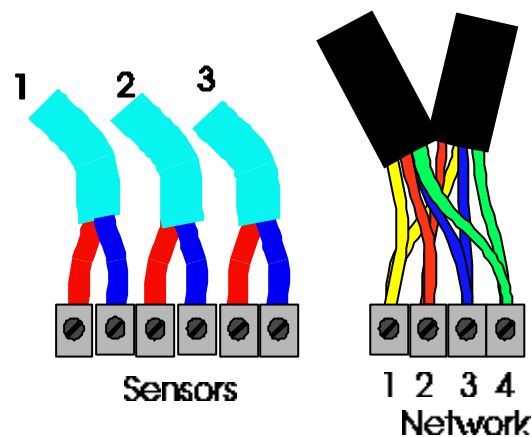
When using standard sensors with IP65 converters, there are two important considerations:

- Standard sensor cables are fitted with telephone connectors: it is necessary to cut off the plugs to use them with an IP65 converter. Before cutting off the plugs, please consult sensor connections to find out which two of the four wires must be connected to the screw terminals.

- Standard sensor cables are elliptical, and have a ridge down one side. If the unit is to be exposed to large amounts of water, it may be necessary to improve the seal between the cable gland and the sensor cable. This can easily be done by putting adhesive-lined heat shrink round the cable where it goes through the cable gland.

EL026 Temperature/Humidity Converter

Specification

Temperature	Range	-40 to 85°C	
	Accuracy	±0.2°C (0 to 70°C)	
		±0.3°C (rest of range)	
Humidity	Range	0 to 100%	
	Accuracy	±2% (0 to 90%)	

The EL026 converter contains calibration information specific to the EL030 humidity sensor.   Please ensure that the sensor is used only with the converter that it was supplied with. Each unit in the pair has a label on the base which shows the serial number of the sensor.

Each EL001 or EL026 converter has an address - a number between 1 and 15. If you wish to connect more than one converter to your logger, each converter must have a different address.   If you have two converters with the same address, install the software on your computer and then use the 'Change converter address'
program to change the address of one of the converters.

The EL026 is designed to work with logger version 13 and above. If, when you power on the logger, it reports a logger version of 12, please contact Pico Technology.

The sensor must be situated away from direct contact with water and away from sunlight. Temporary exposure to either is unlikely to damage the unit, but the unit will give incorrect readings while it remains exposed.

The sensor can be attached to the wall either using adhesive foam, or by removing the cover and using two screws to attach the unit to the wall.

EL016 Voltage converter

The EL016 voltage converter accepts eight voltage inputs. Each input can accept a voltage in the range 0 to 2.5 volts.

The EnviroMon network allows a maximum of 3 values per converter, so the EL016 appears on the network as three separate addresses. The following table shows the pin connections and channel numbers for an EL016: Address A is the first address, B is the second address etc. An EL016 with a starting address of 4 would appear on the network as addresses A=4, B=5 and C=6.

Address	Channel	Pin
A	1	5
A	2	9
A	3	4
B	1	8
B	2	3
B	3	7
C	1	2
C	2	6
Ground		1

The EL016 is designed to work with logger version 15 and above. If, when you power on the logger, it reports a lower logger version, please contact Pico Technology.

 It is possible to display the voltages as other parameters - see the PSC file section of the signal conditioner help file for more information.

EL036 Signal conditioner converter

The EL036 signal conditioner accepts two signal conditioners. Alternatively, it can be used for two voltage inputs in the range ±2.5 volts.

The following signal conditioners may be used:

Conditioner

CM004	Pt100 platinum resistance	Temperature
CM005	Type K Thermocouple	Temperature
CM007	4-20mA (powered)	Various
CM008	4-20mA (isolated)	Various
CM015	10V bridge	Pressure, Load
CM019	Current transformer	AC current, power

The EL036 is fitted with a DC power connector. As long as the current used by all signal conditioners on the network is less than about 50mA, it is not necessary to attach a power supply. It will usually only be necessary to attach a power supply with CM007 conditioners (max 20mA per conditioner) and with CM015 if the bridge resistance is less than about 500 ohms.

The EL036 is designed to work with logger version 15 and above. If, when you power on the logger, it reports a lower logger version, please contact Pico Technology.

Click here for more information about signal conditioner modules.

EL037 Voltage/ 4-20mA converter

The EL037 has four inputs, however only three can be used with logger version 15 and earlier. It also has an external power input: this can be used to supply power (perhaps 12 or 24V, depending on requirements) to the sensors.

Each input can be configured using jumpers to accept either ±2.5V,±10V or 4-20mA. It can be configured for other voltage ranges and for resistance measurement with minor component changes. The following diagram shows how to set a jumper to select the input type for a channel.
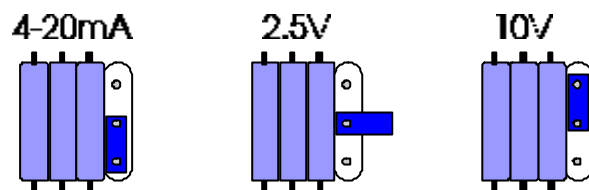
When measuring voltages, or for measuring 4-20mA with the transmitter supplying the loop current, the input is connected between In and GND. The PWR connector can be used to supply power to the transmitter:
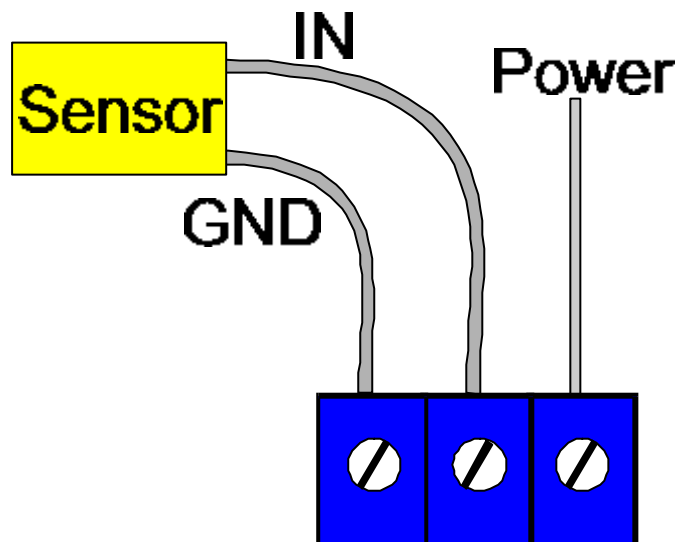
When measuring 4-20mA with the EL037 supplying loop current, the transmitter should be connected like this:
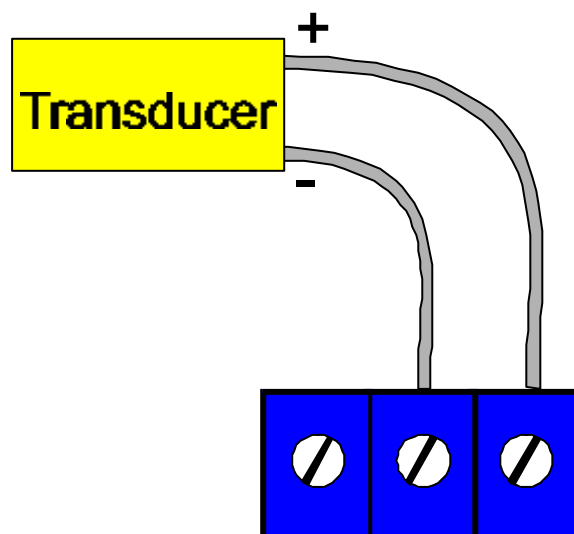
EL008 Logger with Display

The logger can be used with a computer or as a stand-alone logger. If you use a stand-alone logger, you will still need to connect it to a computer during the installation and set up process. However, once the system is operational, you can disconnect the computer and control the logger using the built in buttons and display.
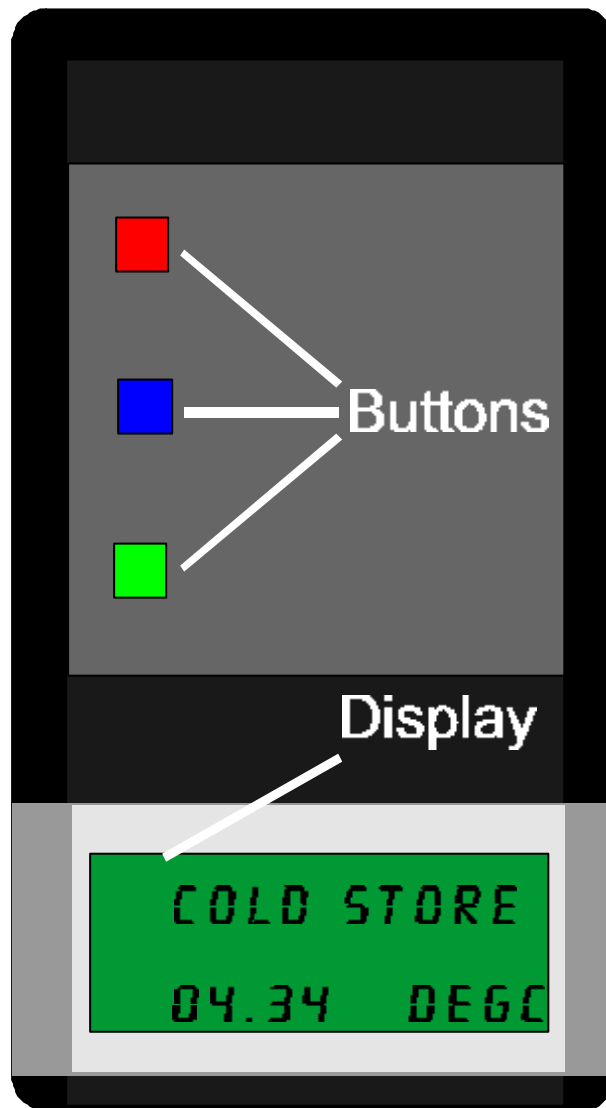
Connections

Both types of logger have four sockets on the base:

- a round DC power socket: the cable from the mains adaptor supplied with the logger plugs in here
- two square network sockets
- a D-shaped serial port socket which connects either to a computer serial port or to a printer using the serial port adaptor supplied.
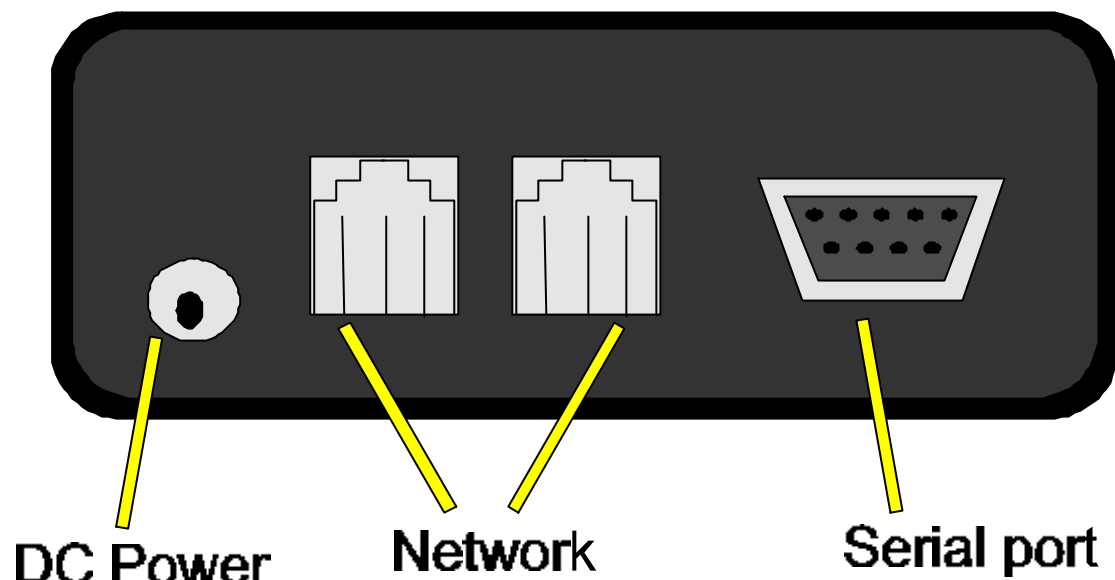
Batteries

The logger has a battery compartment for 4xAA batteries: these batteries keep the system running during a mains power failure, for up to 24 hours. The EL018 dialer adapter/battery backup can provide power to the system for much longer periods in the event of mains failure.

You should change the batteries at least once a year, and after a mains power failure of more than a few minutes.

The unit switches to battery power as soon as the mains power goes off. If the system is not in use, you should remove the batteries, otherwise they will discharge.

Mounting

The logger is intended to be wall-mounted, with the cables coming out of the bottom of the unit. The EL013 mounting bracket can be screwed to the wall, the logger then clips into the bracket.

Bracket

Logger

Screws

Cables
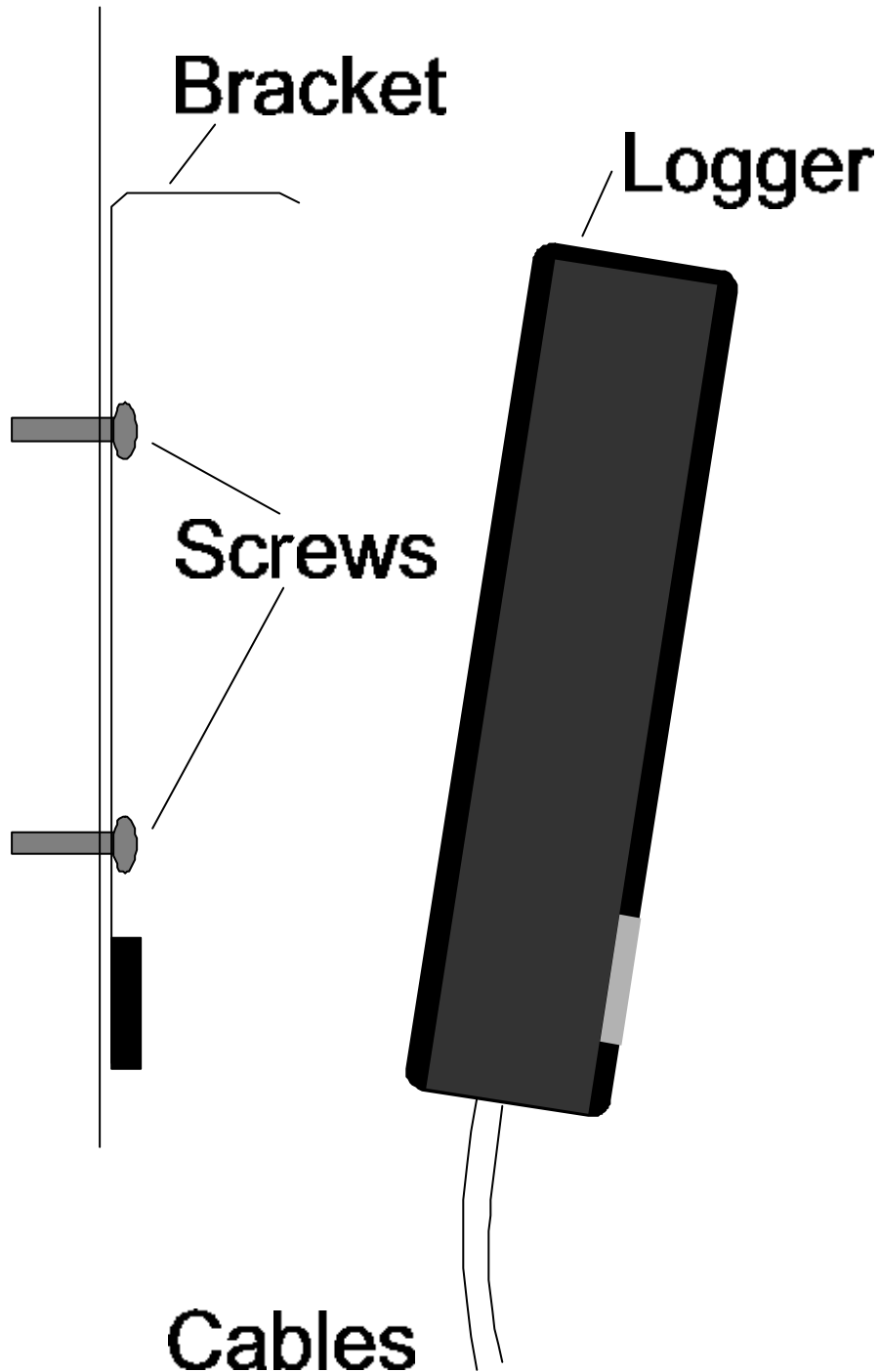
Logger Display

The logger with display is a large, black box with an LCD display and three buttons - red, blue and green.   Under normal operation these buttons have the following functions:

- red - Cancel Alarm
- blue -Hold/Release
- green -Menu Mode

When you power on the unit, the LCD displays some details about the software.   If all is well, the system is then operational and will continuously cycle through each of the sensors, displaying the name and reading for two seconds followed by the date and time for two seconds.

By pressing the blue button, you can hold the display on a particular sensor.   The display will then show only the temperature for that location. Pressing the blue button a second time will release the sensor and the display will then go back to the normal cycle.

If a temperature goes out of range the alarm will sound.   Once you have checked the display to find out which sensor is out of range and how long it has been out of range, you can then press the red button to turn off the audible alarm. The audible alarm will remain off for the duration of the current out-of-range but will sound again if the temperature goes back into range and then goes out of range again, or if a different sensor goes out of range.

The green menu button provides you with options for
- Setting the date
- Printing Reports

Setting the date.....

The logger needs to know the correct date so that it can put the right date on the reports.

To set the date:

- press green Menu mode button
- press the Increase button until the display shows 'set date'
- press the green button to accept
- press the increase/decrease buttons to obtain the correct year
- press the green button to accept
- repeat this process for the month, day, hour and minute.

Printing Reports.....

To print out reports you will need to connect the logger to either an Epson dot matrix printer or a tally-roll printer via the serial cable and adaptor.

To print a report:

- press the Menu mode button to display a menu option
- press the red button until the report you require is displayed
- press the green button to accept

For a midnight to midnight report you can select what day you want to print a report for.... you can usually go back two or three days.

If your logger is connected to a computer, there are many more facilities available to you. See section 5 Software Features.

The Display

Under normal operation when all is well, the display will show sequentially the name of each sensor and the temperature for that sensor. The information for each sensor will be displayed for about 2 seconds.

If the temperature for a sensor is within range, the display will look like this:

> Temperature
> **15.45** degC

 If a temperature goes out of range, or a sensor fails, the logger will sound an alarm and will show, alternately, the following two displays for the sensor.

> Temperature
> -15.45 > -18.00

> Temperature
> Active 00:05

The first display shows you what is wrong: the temperature (-15.45°C) is above the allowed maximum (-18°C). The second display shows you how long the problem has been active, in hours and minutes.

In some installations, the temperature may go out of range during a defrost cycle. The logger is programmed not to sound the alarm until a temperature stays out of range for more than a pre-specified period - the same time as a normal defrost interval. If a sensor is out of range but the logger is programmed not to sound the alarm yet, or if the logger has sounded the alarm and a user has cancelled the alarm, the logger shows a black rectangle in the bottom right hand corner of the display.

EL005 Logger without display

The EL005 logger has no display or buttons, and so it can only be used with a computer.

The EL005 does not have an internal alarm: if you need an audible alarm, connect an EL006 audible alarm unit to the network.

Connections

The logger has four sockets on one end:

- a round DC power socket: the cable from the mains adapter supplied with the logger plugs in here.
- two square network sockets
- a D-shaped serial port socket which connects either to a computer serial port or to a printer using the serial port adapter supplied.

The logger also has a red light (LED) next to the serial port.

Batteries

The EL005 logger has internal re-chargeable batteries. These batteries are kept topped up whilst mains power is available, and will keep the system running for up to 24 hours during a mains power failure. The EL018 dialer adapter/battery backup can provide power to the system for much longer periods in the event of mains failure.

You should check the batteries at least once a year, and replace them if they cannot keep the logger going on standby for a satisfactory period.

The unit switches to battery power as soon as the mains power is disconnected, so it will take some time for the batteries to recharge after a long period without mains power.

LED
When the unit is first powered on, the red light comes on continuously while it carries out a selftest.

If the unit is not configured, the light flashes at a uniform rate, once per second.

If the unit is configured, the light shows traffic on the EnviroMon network: this normally shows as a sequence of very short pulses every three to five seconds.

EL006 Remote alarm

The remote alarm is useful when the room where the logger is located is not often occupied. One or more remote alarms can be connected at any place along the network where staff will hear the audible alarm

The remote alarm looks like a standard converter, but has only the network sockets.   It is connected to the system using two network
extension cables.

EL011 Alarm relay

The alarm relay can be used to turn on or off an electrical circuit when an alarm occurs. This could, for example, be used to control a warning lamp or siren. The relay contacts are rated at 250V at 1A: the unit can therefore be used to control mains equipment.

The unit is supplied in an IP65 enclosure. It is fitted with five cable glands: network in and out, mains in and two mains out. The unit is supplied with a stopper in each cable gland: for unused cable glands, the stopper can be left in place.

The alarm relay can be connected to the network using either telephone connectors or screw terminals: if you wish to use telephone connectors, the cable glands should be removed.

The relay has two sets of contacts. Each set of contacts has one normally-closed contact and one normally-open contact. There are two spare pairs of screw-terminals which are unconnected: these can be used to connect neutral and earth wires.
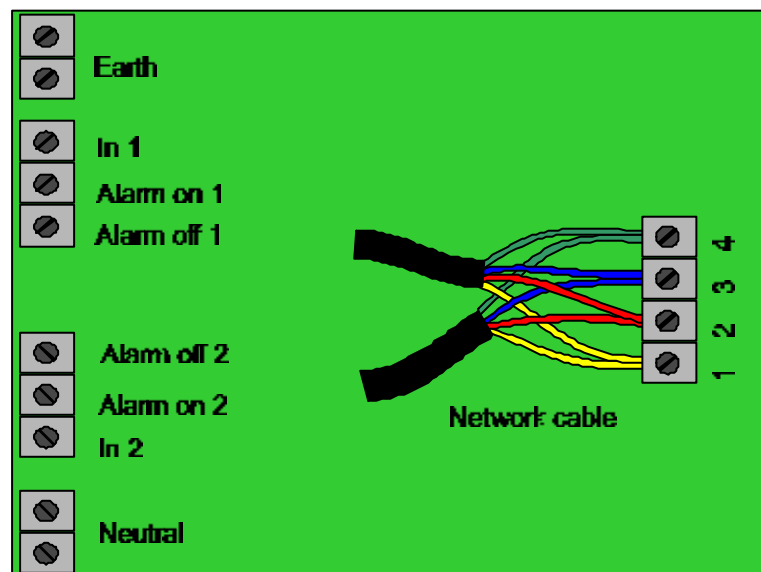
Safety note: If you are using the alarm relay to control mains electricity, the unit should be installed by a qualified electrician.

The following diagram shows how to connect a single mains device (for example a siren) so that it is turned on when an alarm occurs.
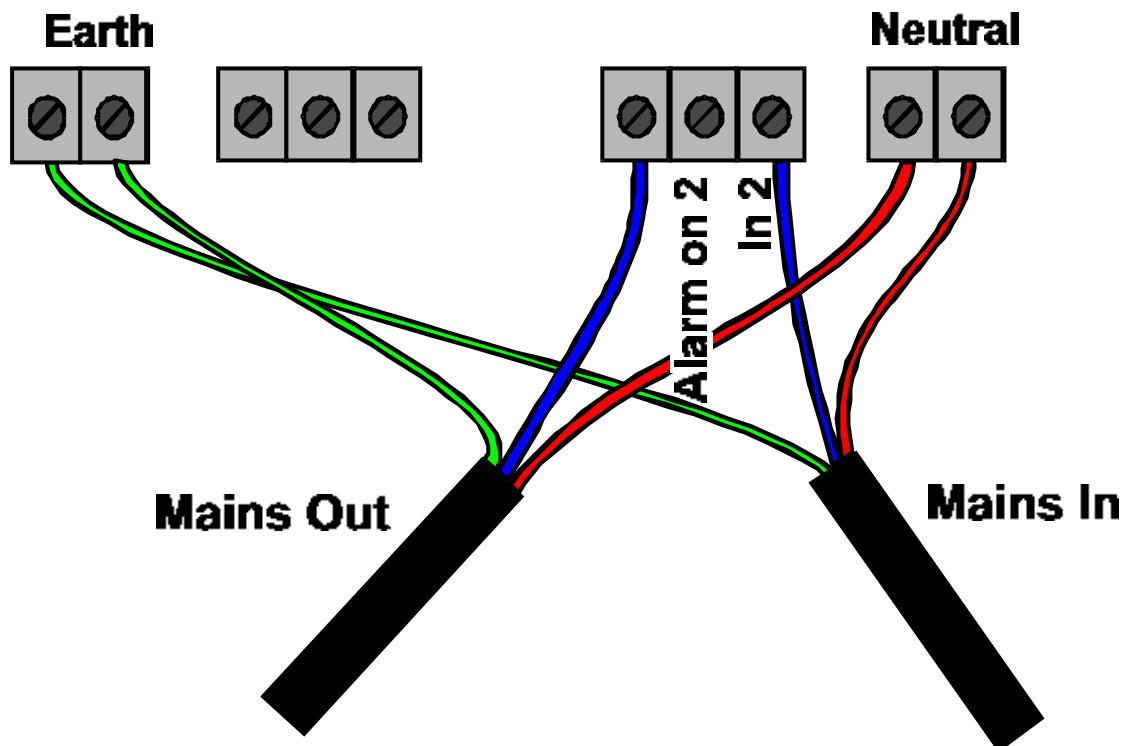
If you connect a green lamp to the normally closed contact and a red lamp and/or siren to the normally open contact, the green light will stay on when everything is OK, and the red light will come on when a temperature is out of range.
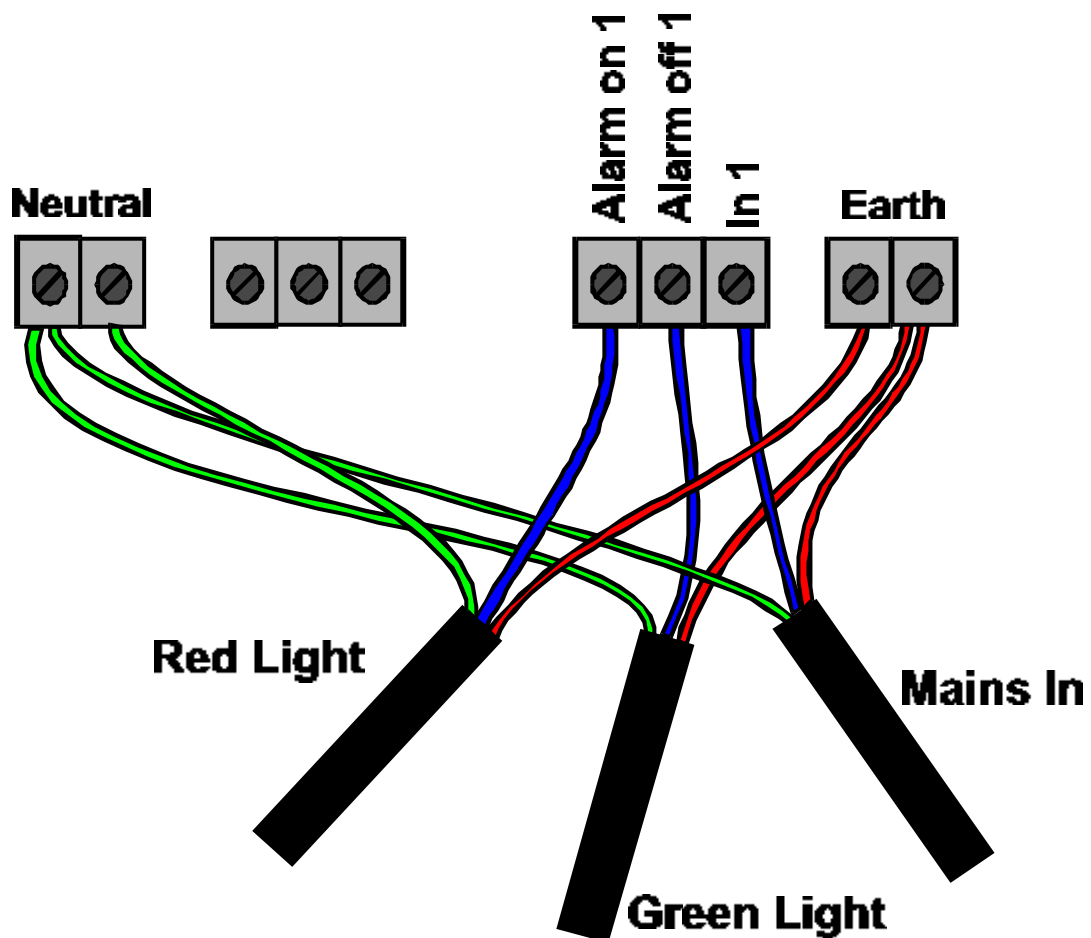
EL018 Dialer adapter/battery backup

The EnviroMon system is designed to operate with the Gardiner Technology Gardtec dialer or the Menvier Security SD1 Speech dialer. The system can also work with other dialers by connecting them via the EL011 alarm relay unit.

The dialer can be programmed with a list of emergency telephone numbers. When there is a problem, the dialer calls each of the telephone numbers in turn until someone answers, then it gives a message saying that there is a problem.

The dialler behaves in the same way as any normal extension and does not affect the normal operation of the telephone.
The dialer adapter serves three purposes:

- it controls the dialer
- it provides power for the dialer and for the system
- it can provide battery backup for much longer periods than the logger's internal backup

The dialer adapter is supplied in a grey plastic box with a clear lid. The box has a large hole each side for cables. There is space for a 1.2AH battery inside the box: this will provide backup for 12 to 24 hours, depending on the configuration. Alternatively the unit can be connected to a car battery outside the box: this could provide backup for many days.

Safety note: When using an 1.2AH battery inside the box, do not attempt to seal the cable holes, as this may cause an explosive build-up of gases inside the box.

The Speech Dialer can give three messages for different types of problem as follows:

- A - temperature out of range or sensor fail
- B - mains fail for more than 5 minutes
- C - network fail for more than five minutes.

There is a separate wire between the adapter and the dialer for each problem: if you do not wish to have calls made about a problem, leave the wire unconnected.

There is a red light for each problem: the light is turned on when the problem is detected. There are two green lights- one for mains power and one for battery power. When the mains is on the battery is kept charged up continuously and both the mains and the battery lights remain on.

There are three groups of screw terminals on the EL018: these serve the following purpose:

- backup battery
- speech dialer
- network (you can use the phone connector sockets if you prefer).

When using the EL018, the mains adapter plugs into the EL018 and not the logger: the logger is powered from the EL018 via the network cable.

The connectors and lights on the EL018 are laid out as follows:
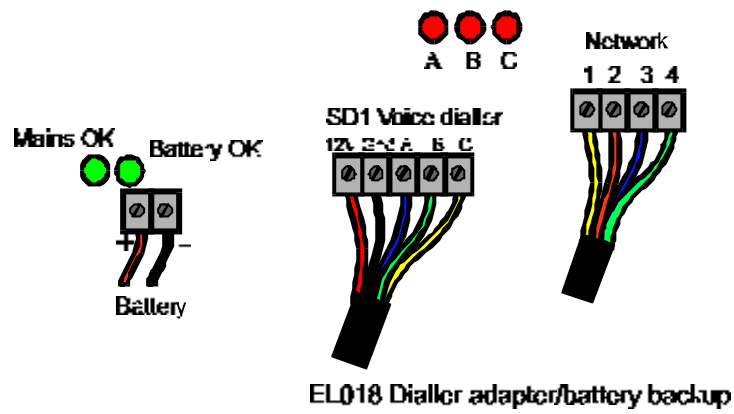
When it is wired into the system, it will look like this:
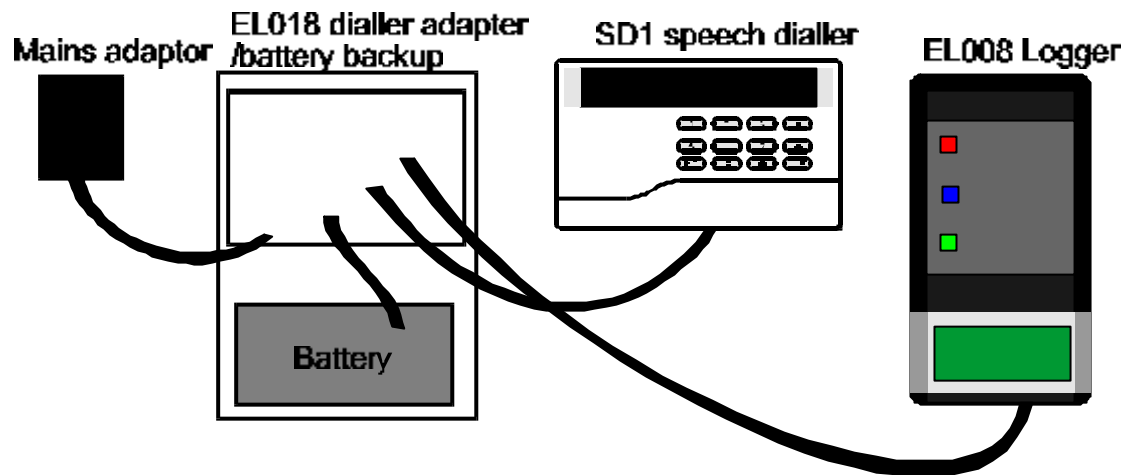
Chapter 4: Getting started

Identifying the equipment

You will need the following equipment in order to set up a simple test system:

Computer
The computer must be running Windows 3.1, 95,98,ME,NT or 2000. It must have at least one spare serial port

Serial port
This is a D-shaped male (with pins sticking out) socket on the back of your computer. The socket can have either 9 or 25 pins: if the socket has 25 pins, you will need to use a D9-to-D25 adapter. Most computers have only two serial ports- these are called COM1 and COM2. The ports are not normally labelled, but it is usually safe to experiment to find out which is which.

D9-to-D25 adapter
This is supplied with the EnviroMon system: it is only needed if your computer has a 25-pin serial port.

Serial cable
This is a cream-coloured round cable about 2 metres long with D-shaped 9-pin connector at each end. The male end (the one with pins sticking out) connects to the logger: the female end attaches to the serial port on the computer.

Mains adapter
This is a black plastic block with a built-in mains plug. It has a black two-core cable that goes to a round DC connector, which plugs into the power socket on the logger.

Logger
The logger collects data and stores it until the PC is ready to receive it. There are two types of logger- the EL005 (grey box) and the EL008 (black box with a display). The logger has the following connectors:
- round DC connector to mains adapter
- D9 female connector to computer
- two square telephone-style connectors for network

The two network connectors are joined internally, so you can use either socket, or both.
When you connect power to the EL008, it shows some version information on the display. When you connect power to the EL005, the red light comes on for a few seconds and then starts flashing.

Network cable
This is a white oval cable about five metres long with telephone-style connectors at both ends. Note that network connectors are slightly larger than sensor connectors. Network connectors have six slots in the end, although only the middle four slots are fitted with gold contacts.

Converter
The converter changes the electrical signal from a sensor into a digital message that is transmitted to the logger. There are several types of converter: the most common is the EL001 temperature converter. The EL001 is a black plastic 'soap box' with two square network sockets at one end and three sensor sockets at the other end.
Each converter has an 'address'- a number between 1 and 15, which is used to identify the converter. The address appears on the top left hand corner of the converter.

Temperature sensor
Pico supplies several different types of temperature sensor: the most common are the EL015 and the EL039. The EL015 or EL039 temperature sensor is a stainless steel tube, 6mm diameter and 50mm long. It is fitted with a white, oval cable about five metres long, with a telephone style connector on the other end.
The sensor connector is slightly smaller than the network connector: it has four small slots, each containing a gold contact- unlike the network connector, which has an empty slot at each end.

There is a clear plastic label on the cable next to the connector: this specifies the type of sensor (eg EL015), the batch number and the sensor number. The batch number and serial number are unique for each sensor, and can be used as a reference number for calibration information.

See also:

Installing the software

To install the software under Windows 3.1:
- Insert the diskette into drive A:
- Select File on the program manager menu
- Select Run
- Type in a:setup
- Follow the installation instructions

To run the software:
- Select the program manager
- Select the Pico Technology program group
- Double-click on the EnviroMon for Windows icon

To install the software under Windows 95/98/ME/NT/2000
- Insert the CD-ROM (assume that the CD-ROM is drive D:)
- Select Start
- Select Run
- Type in d:setup
- Follow the installation instructions

To run the software:
- Press the Start button
- Select Programs
- Select Pico Technology
- Select EnviroMon for Windows

Setting Converter Addresses

Note: you can skip this section if you have only one converter- for example, if you are using a starter kit. If you are planning to use more than one converter, each converter must have a different address. Most converters has the address written on the top right hand corner. If you have two converters with the same address, you must change the converter addresses so that each converter has a unique address BEFORE you connect up the complete network. To do this:

- Install the software on your computer

- Connect the logger to a serial port on the computer using the cable provided
- Plug the power supply into the mains and connect it to the logger
- connect the first converter to the logger using the network cable

- Press the Start button (Win95 and above)
- Select Programs
- Select Pico Technology
- Select Set Converter Address

- Select the serial port (eg COM2) that you connected the logger to
- Select the address that you wish to use for this converter
- Press the Program button
- Wait until the computer reports that the converter has been programmed
- For EL026 humidity converters, see Calibrating humidity Converters
- Unplug the converter
- Repeat this procedure for each converter

See also:
> Identifying the equipment
> Connecting up the equipment

Calibrating humidity Converters

If you are not using humidity converters, you can skip this section.
The EnviroMon humidity measuring system is made up of two parts- the EL026 converter and the EL030 sensor. These can be connected together using a cable up to 25 metres long.
The EL030 sensor has some calibration information written on the base: before you use an EL026 and EL030 together, you should use the Converter Address program to write this calibration information into the EL026.

To do this, you should connect up the equipment and run the Change Converter Address program as per the instructions for setting the converter address, then you should proceed as follows:

- Select the serial port (eg COM2) that you connected the logger to
- Select the address that you wish to use for this converter
- Press the Program button
- Wait until the computer reports that the converter has been programmed
- The computer will turn on the Calibration button: press this button now
- Enter the lowest figure (normally about 0%) into the first box
- Enter the highest figure (normally about 100%) into the second box
- Press the Program button
- Wait until the computer reports that the converter has been programmed
- Unplug the converter

See also:
Setting converter addresses

Connecting up the equipment

To gain experience with the system, we recommend connecting up a small system, with just a single converter, next to the computer. Once you are confident that you understand how it works, you can install the complete system in the correct place.

Logger to PC
Connect the logger to a serial port on the computer using the serial cable. It may be necessary to use the D9 to D25 adapter as well.

Power
Plug the mains adapter into a mains socket and then plug the DC connector into the logger

Network
Plug one end of the network cable into the logger, then plug the other end into one of the network sockets (labelled Net) on the converter

Sensor
Plug the temperature sensor into the first sensor socket (labelled Ch1) on the converter

You are now ready to start the software and then configure the system.

See also:

Configuring the system

To run the software:
- Press the Start button
- Select Programs
- Select Pico Technology
- Select EnviroMon for Windows

The first time you start up the software, it will offer you three choices:
- a look at the overview section of the help file
- a guided tour of the configuration
- start the configuration

If you select the guided tour, the computer will take you through the basics of setting up the system, explaining what each step involves. Alternatively, you can follow the instructions below.
If you are not in the configuration control panel already:
- select Settings from the Main menu
- select Configuration from the Settings menu

You should now be at the configuration control panel. If you have already configured the system, and wish to start again:
- click on Reset
- when the computer asks you to confirm, Click on Clear

Once you are back at the configuration control panel, it is time to set the sampling rate:
- Click on General
- Click on Sampling
- set the Minutes per Reading field to the required value
- Press OK
- Press OK

Now we find out what equipment is connected.
- Click on Equipment
- Set the serial port field to the one that the logger is connected to (eg COM2)
- Click on Converters
- Click on Auto-configure
- a box will appear and will show you the status of the auto-configure process. After a few seconds, this will disappear and the computer should display the details of your converter in the large box.
- Click on OK
- Click on OK

Now we need to specify where the sensors are to be located, by giving names to them.
- Click on Locations
- Click on Add
- Type in a name for your sensor into the Name field
- Select the channel that you wish to use (channel 1 on your converter)
- Select the type of sensor, for example EL015.
- Click on OK

Now we need to program the calibration information into the logger.
- Click on Program
- a box will appear and will show you the status of the auto-configure process. After a few seconds, this will disappear if the programming completed successfully.

The configuration is complete: we must exit from the program now so that the changes will take effect.
- Click on Exit
- Click on OK

If you have an EL008 logger, the readings should appear on the display after 20-30 seconds. If you have an EL005, you will need to restart the software to display the readings.

Looking at current readings

To look at the current readings, you should start the EnviroMon for Windows program:
- Press the Start button
- Select Programs
- Select Pico Technology
- Select EnviroMon for Windows

If it is more than a few minutes since you last ran the software, the computer will display a box to show you how many readings it has transferred from the logger.

The computer next displays the monitor view - a list of temperatures for each sensor.

From the monitor view, you may find the following features useful:

- Select Settings then Configuration to make changes to the configuration
- Select View... then another option to view stored data
- Select Help then Contents to get the help file contents page
- Select Help then Index to get an index for the help file
- Select Help then Guided tour for a guided tour of the functions used in day-to-day operation.

See also:
> Monitor view
> Displaying graphs

Displaying a graph

To look at the graph, you first need to display the monitor view.
Next you should take the following steps:
- Select View from the main menu
- Select Graph from the View menu

The computer will display a graph showing all data recorded so far.

See also:
> Graph view

EL014/ EL019 Printer

If you do not wish to connect a computer to the logger, you can connect it directly to a printer. The printer connects to the serial port on the logger, using the adapter provided. EnviroMon has been tested with the following types of printer:

Printer part number	Adapter part number	Printer	Paper format
EL014	EL023	Datac 1100	40 column tally roll
EL019	EL024	Epson LX100	80 column A4 paper

Chapter 5: Views

Views

EnviroMon for Windows can display data in five different formats, called views. There are five types of view:

- a monitor display, which shows current temperatures and alarm state
- a graph, showing the temperature over a period of time
- a summary - the statistics and error information for a period
- a spreadsheet, detailed temperature information in a format which can be copied to a clipboard.
- an event display, which shows each of the occasions on which an out of range or sensor fail has occurred.

The monitor view is displayed when you start the program: the other views can be selected from the monitor view menu.

Monitor View

When you start EnviroMon for Windows, the computer displays the monitor view, which looks like this:
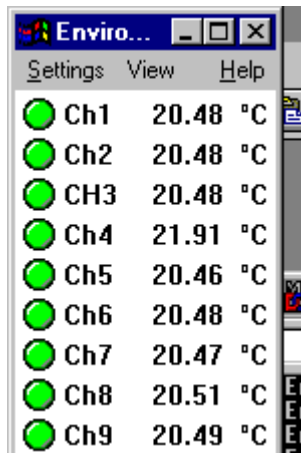
This view has a menu which gives access to other views and a line of information for each active sensor.

At the left of each line is an indicator lamp which changes colour depending of the state of the sensor:
{bml normal.bmp} The sensor value is within range
{bml warning.bmp} the sensor value is currently out of range, but has not been out of range long enough to raise an alarm
{bml active.bmp} the sensor is in an alarm state: use the mouse to click on the lamp: this will cancel the alarm
{bml acknowl.bmp} the sensor is an alarm state, but the alarm has been cancelled

Next to each lamp is the sensor name and the current temperature. The temperature is updated every few seconds.

The monitor view has a menu: you can use the menu to
- select what sensors appear on the monitor view
- activate other views
- configure the system
- specify various options (colours, sounds)

When the monitor view is running, you can find out about the menu by pointing at a menu option, then pressing the F1 key. To find out more now, click on menu.

If you minimise the monitor view, the computer will display an icon which shows whether there are any warnings or alarms:

If an alarm occurs, you can then double-click on the icon to restore the monitor view.

Graph View

When you select the View | Graph menu option, the computer opens a new window like this:
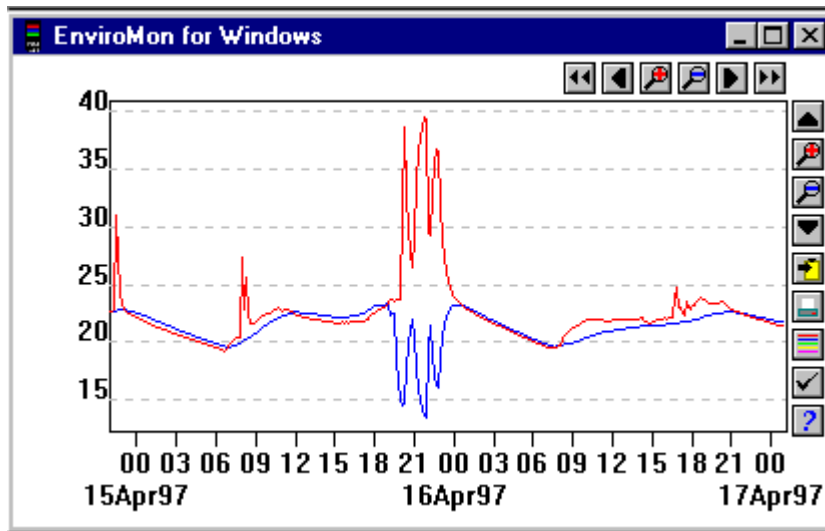
There are a number of buttons in the top right of the screen. The group of horizontal buttons selects what time interval is displayed:

{bml fastleft.bmp} move a whole display left (earlier)
{bml left.bmp} move a quarter display left (earlier)
{bml taller.bmp} magnify the middle half of the display to fill the whole width
{bml shorter.bmp} shrink the current display to half size, so that more is displayed before and after
{bml right.bmp} move a quarter display right (later)
{bml fastrigh.bmp} move a whole display right (later)

The upper group of vertical buttons controls the vertical range displayed: note that if you use these controls to change the vertical range, auto-scaling is turned off. Use the options button (see below) to turn auto-scaling back on again.

{bml up.bmp} move a whole display up
{bml taller.bmp} magnify the middle half of the display to fill the whole height
{bml shorter.bmp} shrink the current display height to half size, so that more is displayed above and below
{bml down.bmp} move a whole display down

The remaining vertical controls are:
{bml clipboar.bmp} copy the graph to the clipboard

Print print the graph

{bml channels.bmp} select the channels to display on the graph
{bml options.bmp} specify the options for the graph
{bml help.bmp} enter the help info for the graph view

If you move the mouse cursor onto the graph part of the screen, the computer will display the temperature and time at the current cursor position.

Summary View

When you select the View | Summary menu option, the computer opens a new window like this:

The period box contains the time interval for the summary. You can either type in a start and end time and date, or you can use the buttons to alter the range. The controls are as follows:

{bml left.bmp} move a quarter period earlier

{bml taller.bmp} halve the current period

{bml shorter.bmp} use twice the current period

{bml right.bmp} move a quarter period later

The sensor box shows which sensor is to be displayed in the summary: if you select a different sensor, the display will be updated.

Print prints out a summary for all sensors for the current period.
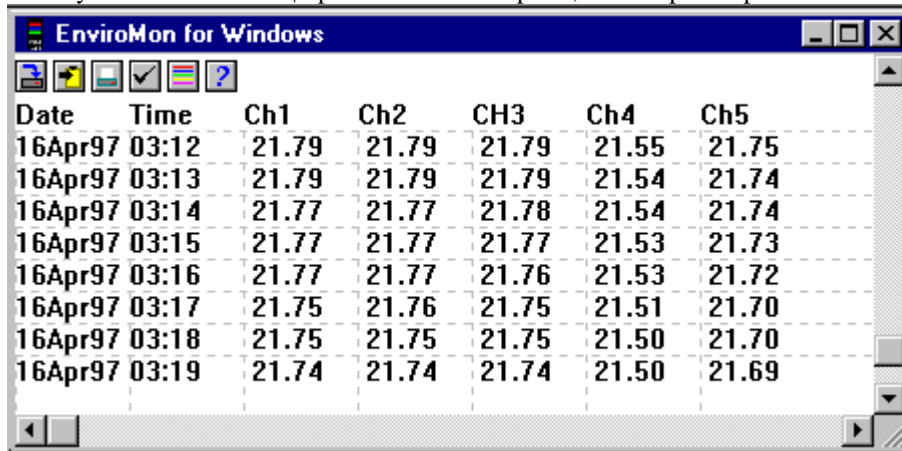
The Statistics box shows the number of readings during the period for this parameter, and the minimum, maximum and average for the period.

If the readings go out of range during the period, the computer displays a separate figure for the average of the in-range values, ie it excludes the values that are out of range from the average calculation). This is useful if the parameter only goes out of range under known circumstances, for example during a defrost cycle on a chiller. The in-range average appears in brackets on the printed report.

The Problems box shows the number of times and total time the value has been out of range. There are separate figures for above range, below range and sensor fail.

Spreadsheet View

When you select the View | Spreadsheet menu option, the computer opens a new window like this:

There is one line for each reading. The first two columns show the time and date: the remaining columns show the selected sensors. The scroll bar on the right selects the range of times to display.

The following options buttons are available:
{bml channels.bmp} select the sensors to display.
{bml options.bmp} Spreadsheet options: specify whether to display individual readings, or average, minimum and maximum for a period

If you select a range of readings, you can use the following buttons:
{bml disk.bmp} write the readings to a disk file
{bml clipboar.bmp} write the readings to the clipboard.

You can select a range in one of three ways.

If all of the readings that you want to select are on the screen:
• point the mouse at the first reading
• press and hold down the left mouse button
• drag the mouse to the last reading: the selected readings will be highlighted as you go
• release the left mouse button

If the readings are a long way apart:
• point the mouse at first reading
• click the left mouse button: the first reading will be highlighted
• scroll down to the last reading
• point at the last reading
• press down the shift key and click the left mouse button

If you wish to select all of the readings for one day:
• point the mouse at any reading during the required day
• click the left mouse button: the reading will be highlighted
• click on the 'select day' icon

Event View

When you select the View | Event menu option, the computer opens a new window like this:
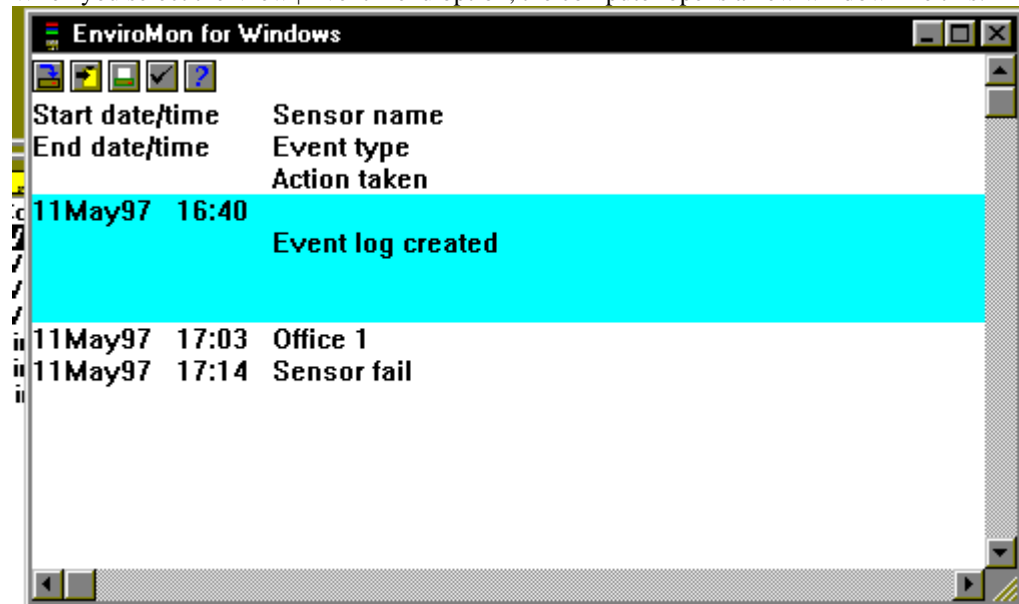
There are two or four lines of text for each event. At the left is the start and end date/time: the end date/time is omitted if the fault is still active. Next to these are the sensor name and a description of the fault. If **Show action taken** is enabled, the action taken will be displayed beneath the fault description.

The scroll bar on the right selects the range of times to display.

To select a range of readings, you can use the following buttons:
{bml disk.bmp} write the events to a disk file
{bml clipboar.bmp} write the events to the clipboard.
{Print} print the events.

You can select a range in one of two ways.

If all of the readings that you want to select are on the screen:
• point the mouse at the first event
• press and hold down the left mouse button
• drag the mouse to the last event: the selected events will be highlighted as you go
• release the left mouse button

If the events are a long way apart:
• point the mouse at first event
• click the left mouse button: the first event will be highlighted
• scroll down to the last event
• point at the last event
• press down the shift key and click the left mouse button

To edit the notes on action taken for an event, point at the event with the mouse cursor and double-click the left mouse button.

Chapter 6: Configuration dialogs

Main control panel

General panel dialogs

Security dialogs

Equipment: Loggers

Equipment: Converters

Locations of sensors

Configuration Panel Dialog

This dialog is the main control panel for configuring the system.

For a first-time installation, you should use each of the buttons in the sequence that they appear- **General**, **Equipment**, **Locations**, **Program**, Exit.

If you later wish to make adjustments to the system, you can go straight to the function that you wish to change, then use the **Program** option to write the new configuration to the logger.

Note: the logger must be connected before you use the Program option, or the auto-configure option in the Converters dialog (part of Loggers): the remaining options can be used without the logger connected.

General
This option leads to the general settings panel: there are buttons to set the sampling interval, temperature units and other system-wide parameters.

Security
This option is only necessary if you wish to restrict access to the configuration parts of the software. It enables you define a list of persons is authorised to use the system.

Equipment
This option works in two modes. For a single logger system, it displays a logger dialog which allows you to specify how the logger is connected to the computer. There are also buttons to enter converter information, and details about more advanced logger functions (logger printer, reporting, alarm dialer etc). For a multi-logger system, it displays the logger list dialog which enables you to add or edit details for a number of loggers.

Locations
This option displays a menu of sensors attached to the system, and provides options to add or edit sensors. The sensor information includes the sensor name, its address (logger, converter, channel) and the alarm limits for the sensor.

Program
This option writes the configuration information to the logger. The process is automatic: just plug in the logger, then press the button and wait for it to complete.

Logger Dialog

This dialog enables you to specify how the logger is connected to the computer. There are also buttons which give access to other dialogs for entry of converter details and advanced logger functions (printing, etc).

Connection
This option specifies how the logger is connected. The options are:
- **Direct**: the logger is connected directly to the serial port on the computer. You can connect up to nine loggers to the same computer in this way, each to a separate serial port.
- **Via telephone + modem**: the logger is at a remote site: the computer uses a modem to make a telephone call to the logger each time you request information. Use the Telephone button to enter details of the link. It is currently only possible to connect one logger by telephone. If you need to access more, you should create a separate configuration for each logger.
- **Via radio modem**: the computer is connected to a radio modem, as is the logger. Up to 250 loggers may be connected: each logger must have a separate address.
- **Via IP network**: the computer is connected to an IP network, and the logger is connected to another computer on the same IP network. See How to access a logger via a network for more information

Loggers are supplied programmed for direct connection at 9600 baud: If you change the baud rate option or you wish to use a telephone modem, you should use the **Set Link** option (see below) to write the link parameters into the logger.

Serial Port
This option selects which COM port is to be used (not applicable for IP network).

Data rate
This options specifies the data rate to use for the link to the logger. For a direct link over a short cable, use 57600 baud. For a modem, check the maximum speed that the modem can handle. Note that most modern telephone modems can operate at 57600 baud to the logger, even if they operate at a lower speed over the telephone link. (not applicable for IP network).

Server
This is for use with IP networks only. Set this to the name of the computer that the logger is connected to. You must run the EnviroMon agent on the computer that you specify.

IP port
This is for use with IP networks only. Set this to the same port as you specify for the EnviroMon agent. The normal setting is 1051. You might need to use a different value if 1051 clashes with some other application, or if you wish to connect multiple loggers to the same computer.

Address
This option is used on a multi-logger radio link. Each logger has a unique address between 1 and 255: all loggers receive all messages from the computer, but only respond to messages containing their address.

Enable support for multiple loggers
Most systems require only a single logger, so the computer normally only presents a dialog for a single logger. Even if you wish to use multiple loggers, it may be more practical to set up a separate configuration for each logger: that way, the data for each logger is kept separate. This option is only useful if you wish to combine the data from multiple loggers.

If you check this box, the computer replaces this dialog with the logger list dialog: with it, you can add, edit or remove the details for loggers.

Converters
This button gives access to a list of converters attached to this logger.

Options

This button gives access to the logger options dialog which controls optional equipment that can be connected directly to the logger.

Telephone

This button accesses the logger phone dialog, which enables you to specify how the dial-up link to the logger is to operate.

Set link

This button programs the connection settings into the logger. Loggers are supplied ready configured for direct connection to the computer, so you do not need to use this option for loggers intended for direct connection.

This option is ONLY used when you have changed the connection mode. Connect the logger directly to the port that you have specified, then press the button and wait for it to complete. The programming is automatic.

Note: The logger must be powered down and restarted to activate the new link parameters.

Logger Phone Dialog

This dialog enables you to specify the details of the telephone link to the logger.

Connect at startup
This option specifies whether the computer should start a connection to the logger each time EnviroMon for Windows starts up. The options are:
- **Don't connect**: the logger is connected directly to the serial port on the computer. You can connect up to nine loggers to the same computer in this way, each to a separate serial port.
- **Disconnect after data transfer**: the computer dials the logger at start-up, but releases the link as soon as all of the new data has been transferred from the logger.
- **Remain connected**: the computer is connected to a radio modem, as is the logger. Up to 250 loggers may be connected: each logger must have a separate address.

You can manually connect or disconnect at any time: this option simply controls the automatic connection at start-up.

Telephone
This field contains the telephone number that the computer should use to establish a link to the logger.

Logger will always answer phone
If you check this box, the logger will keep its modem permanently enabled, so that it will always answer an incoming call. This is OK if the logger modem is on a separate phone line.

If you leave this box unchecked, you can specify a time- range in which the modem will answer calls. This means that the modem can be connected to a phone line which is used for voice calls during the day, but which is enabled for modem access to the logger outside working hours.

Answer telephone between...
These two fields specify the time range for which the modem is to be enabled, when Logger will always answer phone is unchecked.

Logger List Dialog

This dialog appears when you enable support for multiple loggers. At the left is a list of loggers: at the right are buttons to add, edit or remove loggers. The add and edit buttons open up a logger dialog.

Logger Options Dialog

This dialog contains controls for optional equipment connected to the logger.

Printer
The logger supports two types or printer. These printers connect to the serial port on the logger: each requires a different adapter. The Pico part numbers for the adapters are as follows:

- Epson FX300 - A4 page printer (adapter EL024)
- Datac HP1100 - compact tally roll (adapter EL023)

The logger can print two report formats:
- current - the values right now for all of the sensors
- summary - average, minimum and maximum for a period, with total time and number of occurrences for out of range and fault conditions

These reports can be requested manually, or can be printed at fixed time intervals.

Alarm dialer

The logger can be connected to a dialer unit: when an alarm occurs, the dialer calls a specified number and delivers a recorded message. The dialer connects to the logger using an EL018 dialer interface. In addition to providing a link to the dialer, the EL018 provides the following functions:

- a larger backup battery, with mains charger
- detection of mains failure
- detection of network failure (the logger is no longer in contact with the EL018)

On detection of mains or network failure, the interface can be programmed to activate the alarm dialer after a specified period of time.

Converter List Dialog

This dialog shows a list of converters connected to the selected logger. There are also controls to add or remove converters, or to automatically detect the converters connected to the logger.

Converter list

The converter list shows the address and type of each of the converters attached to the logger. Each converter must have a different address. The address is written on the top right corner of the converter. You can use the change converter address program to alter the address of a converter.

It is not necessary to add devices which do not have sensors (eg EL006 remote alarms), however the auto-detect function will add them to the list as a check that they are linked correctly to the logger.

Note: Each EL016 voltage converter requires three addresses, so it appears three times in the list.

Add

Press this button to add a new converter to the logger: this will open up the converter dialog.

Remove

Highlight one of the converters in the list, then press this button to remove it.

Auto-detect

Press this button to automatically update the list of converters connected to the logger.

Note: the logger must be connected before you select this option.

Converter Dialog

This dialog is used to enter the details for a new converter.

Converter type
This is the type of converter. Note that IP65 converters are electrically identical to the standard form, and the system does not distinguish between them. Even if you select the IP65 format, it will be converted to the standard format in reports.

Address
This is the number which appears in a box on the top right of the converter. Each converter connected to the logger must have a different address: If you have two converters with the same address, you should use the **Change converter address** program to change the address of one of the converters.

If you make a mistake and enter the same converter twice, the computer will warn you when you try to program the logger.

Sensor List Dialog

This dialog shows a list of the sensors connected to all loggers and converters in the system. There are also controls to add or edit the details for sensors.

Sensor list
This list has a line for each sensor. It shows the address of the sensor (logger, converter and channel) and the sensor name. If the sensor is disabled, an X is displayed before the address.

Add
To add a new sensor to the list, press the Add button: the computer will display the sensor dialog.

Edit
To edit the details of an existing sensor, click on the sensor that you wish to change the details for, so that it is highlighted. Then press the Edit button: the computer will open up a sensor dialog.

Note: there is no option to remove a sensor: this is because there may still be historic data stored for a sensor, even though the sensor has been removed. Instead, you should edit the sensor details and un-check the 'enabled' option.

Sensor Dialog

This dialog is used to add or edit the details for a sensor. There are three main groups of information: the name, the data source and the alarm details.

Name
This can be any text that you wish to use to describe the sensor. It can be up to 32 characters, but only 16 characters will appear on the display of the logger.

Sensor enabled
It is not possible to remove sensors, as there may be historical data stored for them. If a sensor is no longer in use, it should be disabled by un-checking this box: the logger will then no longer collect data from it, but historical data will still be available.

Channel
This box specifies which converter and channel the sensor is connected to. It contains a list of all the channels for converters connected to all of the loggers on the system.

Note that the EL016 appears as three 3-channel converters. The first corresponds to channels 1 to 3, the second corresponds to channels 4 to 6 and the third is channels 7 and 8 (there is no ninth channel).

Converter
This displays the type of converter that the selected channel belongs to. You cannot change this option. Note that this option is replaced by the conditioner type if the converter is an EL036.

Conditioner
This box appears only if the converter is an EL036. is used to select the type of signal conditioner that is fitted to this channel. Normally, it will be set automatically to the correct value when the channel is selected.

Sensor
This box is used to select the type of sensor. You should select the channel and conditioner before specifying the sensor type.
Note: The EL015 and EL039 temperature sensors are very similar. Please check the label on the sensor before selecting the sensor type.

Alarm enable

When the alarm is enabled for this sensor, the alarm will sound when the value goes out of range or if the sensor or converter fails. There are several options:

- Never - the alarm is never enabled for this sensor
- Always - the alarm is always enabled
- Time range 1 - the alarm is enabled only during alarm time range 1
- Time ranges 1 & 2 - the alarm is enabled only during alarm time ranges 1 and 2
- several other combinations, (eg 1 and 3)

See the alarm dialog for more details about alarm time ranges

Minimum value

This is the minimum value for the acceptable range of the sensor. Leave this field blank if you do not wish to set a lower value for this sensor.

Maximum value

This is the maximum value for the acceptable range of the sensor. Leave this field blank if you do not wish to set an upper value for this sensor.

Holdoff

The holdoff specifies the period, in minutes, between the value going out of range and the alarm sounding. This is useful if the value occasionally goes out of range for short periods, for example the temperature of a freezer during a defrost cycle.

The holdoff should be set to the minimum time interval required to prevent spurious alarms: it should be set to zero if an immediate alarm is required.

It should be at least four times the sampling interval, so with a sample time of five minutes it should be at least 20 minutes.

General Panel Dialog

This panel gives access to a number of dialogs which control the overall settings of the system-parameters which are not related to a specific logger or sensor.

Sampling

This button gives access to the sampling dialog which sets the time interval between recorded readings.

Temperature

This button gives access to the temperature dialog which selects the units and number of decimal places for temperature measurements.

Alarm

This button gives access to the alarm dialog which specifies options for alarm handling. (Time ranges, repeat interval, etc).

Site

This button gives access to the site dialog which accepts a site name and contact details for maintenance.

Summertime

This button gives access to the summertime dialog which sets the dates for the start and end of summer time. The logger can then automatically put its clock forward or back at the right time.

Directories

This button gives access to the directories dialog which accepts directory names for data and backup files, and controls cleanup of old data files.

Note: Changes to the general settings are saved when you press the **OK** button. If you press the **Cancel** button, any changes are discarded.

Sampling Dialog

This dialog is accessed from the General Panel, and is used to specify when readings are to be recorded.

Minutes per reading

This is time interval between recorded readings in the logger. The logger measures and displays values from sensors continuously, and then stores the average value at the intervals specified.

Mode

This defines whether to fill the whole of the logger memory with readings and, if so, whether to stop when the logger is full. There are three options:

- **Wrap when full**: when the logger memory is full, it starts overwriting the oldest readings. This is the correct option when you wish to collect data continuously for long periods, as the logger will then contain the most recent readings at any time.
- **Stop when full**: the logger stops saving readings as soon as its memory is full. This is useful if you wish to make sure that you do not lose the readings taken immediately after you start the logger, even if you do not download the information regularly.
- **Stop after n**: same as **Stop when full**, but the **No of readings** field below defines the number of readings to collect before stopping.

Note: If you use **Stop when full** or **Stop after n** modes, you can only restart the logger by disconnecting and reconnecting all power (mains adapter and battery) from the logger, or by re-programming it.

No of readings

This specifies the number of readings to collect before stopping when in **Stop after n** mode.

Temperature Dialog

This dialog is accessed from the General Panel, and is used to specify the units for temperature measurements (Fahrenheit or Celsius) and the number of decimal places (the number of digits after the decimal point) for measurements. Readings are normally displayed in Celsius, with two decimal places, for example 4.65ºC.

Alarm Dialog

This dialog is accessed from the General Panel, and is used to specify the way in which alarms are to be handled.

Hysteresis

If a temperature goes out of range, it must go back in range by at least this much before the logger considers that the problem has gone away.

For example, if the maximum temperature is 15ºC and the hysteresis is 0.5ºC, the temperature must drop to 14.5ºC before the problem is officially over. If the temperature drops below 15ºC but then goes above it again, this will not be treated as a new problem, and so the alarm will not sound again.

Latch alarms

If 'latch alarms' is enabled, the alarm will carry on sounding even after the problem goes away. This is useful if the logger will be left unattended for long periods, and it is necessary to know about problems that occurred while the logger was unattended.

Repeat

This specifies the time interval, in minutes, to wait after an alarm is acknowledged before activating the alarm again. Set to 'None' if no repeat is required.

Time range 1..3

These three buttons open the Time range dialog, which is used to specify a time range during which alarms are to be active - for example, 09:00-17:00 Monday to Friday. There are three time ranges, and a sensor can be associated with any combination of ranges.

Once the details have been specified for a time range, the details will be displayed next to the button.

Holidays

This button opens the holiday dialog, which can be used to specify the dates of up to 12 holidays. Alarm time ranges can be disabled on the specified holidays if required.

Time range dialog

This dialog is used to specify the details for one of the three Alarm time ranges. The alarm for sensor can be enabled during any combination of these time ranges.

Note that it is not necessary to enter any details if you want to have alarms for all sensors either permanently active or permanently disabled.

Monday..Sunday

Check the box if the alarm time range is to be active on the specified day of the week

Holiday

If this button is checked, the alarm time range will be active even on the holidays specified using the holidays dialog. If it is unchecked, the alarm time range will be disabled on holidays.

Start

This is the start time for the range. It must be specified in the format HH:MM, for example 09:00.

End

This is the start time for the range. It must be specified in the format HH:MM, for example 17:00.

Holidays dialog

This dialog is used to specify a list of dates of up to twelve holidays. It is then possible to disable some or all alarm time ranges on the specified holidays. This could be used to disable sensors in processing (rather than storage) areas on days when a processing plant is shut down for a holiday.

Note that it is not necessary to enter any details if you do not need to make special arrangements for holidays.

The dates must be entered in the format DDMmmYY, for example 25Dec99.

Summer Time Dialog

In countries that are a long way from the equator, it is normal to adjust the clocks by one hour at the start and end of summer: this has different names in different countries, for example daylight saving time, or British Summer Time.

You can enter the start and end times for summer time for the next few years, then the logger will automatically adjust its clock on the specified days.

NOTE: In the Northern hemisphere, the start and end times will be in pairs, each pair for the same year: in the Southern hemisphere, the start of summer will be October 1997 and the end of summer will be March 1998.

Site Dialog

This dialog is used to specify the site name and maintenance contact. This information appears on reports printed by the computer or by the logger.

Name

This is the name of the site where the loggers are to be installed.

Maintenance

This is for contact details for maintenance calls: for example, in a freezer monitoring application, it might be the the name and telephone number for the refrigiration engineer.

Directories Dialog

This dialog is used to set the directory names for data files and backup.

Data file cleanup

This option can be used to clean up old data files when they are no longer required. The options are:
- **Keep files indefinitely**: never delete old data files
- **Delete after a month**

- **Delete after three months**
- **Delete after a year**

Auto backup
If this option is checked, the program automatically does a backup when you exit from the program. This is probably more suitable for backup to a network drive, than for backup to a diskette.
If this option is NOT checked, you can still do backups using the Backup option on the file menu.

Data directory
For most applications, it can be left blank: the data will be put into the same directory as the EnviroMon for Windows program.
It can be used either if you wish to place the data somewhere different (for example, on a network drive so that it can be backed up more easily) or if you wish to operate several loggers independently, each with their own data files.
To specify that data files will be stored on network drive G: in a directory called Pico, type in G:\pico.

Backup directory
This is where files will be copied when a backup takes place. This could be either a diskette drive, or a network directory. If you specify a diskette drive, the computer asks you to insert a blank, formatted diskette before each backup.

User List Dialog

This dialog is accessed from the main Configuration Panel. It is used to add new users or edit the details of existing users. It is not usually necessary to specify users if only one person will be using the system. If you do add any users, the computer will ask for a password if you select the 'Configuration' option from the main menu.

User list

This shows details for each of the users who were or are authorised to use the system. An x next to the name indicates that they are no longer active.

Add

Press this button to add a new user

Edit

Click on one of the names in the user list: when the name is highlighted, press the Edit button to edit the details for this user.

User Dialog

This dialog is used to enter the details for a new or existing user.

Name

The users full name

Initials

The user's initials

Password

Password: the computer will ask for this each time somebody enters a secure part of the program

Clearance level

This controls what the user can do. The options are:
- Check: the user is able to check the current temperatures
- Note events: the user is able to edit details of events
- Inspect data: the user is able to look at historical data
- Full: the user has access to all parts of the system, including configuration.

NOTE: when adding the first user, ALWAYS select Full clearance, otherwise you will not be able to get back into the configuration to change it.

Enabled

It is not possible to remove details of old users, as the system may need to refer to this when someone consults historical data: instead, the enabled box should be un-checked. This will remove the person from the list of active users.

Password Dialog

This dialog appears when it is necessary to confirm a user's security clearance.

User

This is a list of active users: select your name from the list

Password

Enter your password here: note that it will not be displayed as you type.

Chapter 7: Dialogs for normal operation

Preferences dialogs
>Colours
>Sounds
>Language

Monitor dialogs
>Select parameters

Graph dialogs
>Select parameters
>Graph options
>Print

Spreadsheet dialogs
>Select parameters
>Spreadsheet options
>Print

Event dialogs
>Event
>Event options
>Print

Select parameters dialog

This dialog is used to select the parameters which appear on the view that it was started from.
The area on the left shows the parameters that are available: the selected parameters are highlighted. To select or deselect an item, point at the item with the mouse and double-click on it.

Group

At the bottom is the group combo-box. You can use this to save and restore a number of named groups of parameters.
To save the current parameter selection as a group, type in the group name and press Save Group.
To select a saved group, open the combo box and double-click on the requested group.
To modify an existing group, make the changes to the parameter selection then type in the group name and press Save Group.
To remove an existing group, de-select all parameters, type in the group name and press Save Group.
On the graph options dialog, you can specify that parameters should be divided into a number of separate graphs, one for each group.

Print dialog

This dialog appears when you press a print button on one of the views.

Printer

At the top is a combo box with the name of the default printer. You can select a different printer if you wish.

Setup

Use this button to open a dialog with setup information specific to the selected printer.

Once all the details are correct, press OK to start printing.

Graph options dialog

This dialog enables you you change the options for the graph view

Format
This selects how the parameters will be displayed. The options are:
- **Automatic** - divide according to units
- **All on same graph** -display all parameters on the same graph
- **Separate graphs** - draw a separate graph for each parameter
- **By group** - display a separate graph for each group (see the select parameters dialog)

Auto scale vertical axis
When this box is checked, the computer automatically adjusts the vertical scale to fit the data that is to be displayed. If you press any of the vertical axis scaling buttons, **Auto scale** is turned off automatically.

Save on exit
When this box is checked, the computer saves the setting when you exit from the graph view.

Colours dialog

This option is used to specify the colours for background, text et cetera. It applies to graph and spreadsheet views. To change a colour, click on the colour button: this will open up a colour selection dialog.

Background
This is the colour for the background on graphs, and for non-selected readings on the spreadsheet.

Text
This is the colour for text.

Grid
This is the colour for the grid on graphs.

Selected
This is the colour for the selected readings on the spreadsheet.

Trace colours
The graph can display up to ten traces: the ten buttons along the bottom of the dialog are the colours for each trace.

Sounds Dialog

For some events, EnviroMon can make a sound when the event occurs. This dialog allows you to enable the sounds for each event.

Beep on each new reading
This option is useful if there is a problem and you need to keep a close eye on it. If you select a graph or spreadsheet view, the computer beeps each time a new reading is added to the graph or spreadsheet.

Beep when lamp is pressed
When there is an alarm, the lamp on the monitor view turns red. You can click the mouse button on the lamp to cancel the alarm. When this option is selected, the computer beeps when you click on a lamp, to confirm that it has accepted your request.

Beep continuously on alarm
When this option is enabled, the computer produces a continuous tone while an alarm is active. This is useful if the computer is not in the same room as the logger.

Language Dialog

This dialog is used to select the language that EnviroMon for Windows and the logger will use.

It is necessary to re-program the logger (using the Program button on the Configuration Panel Dialog) after changing the language, otherwise the computer will give an 'Incorrect configuration' message each time the program is run.

Event Dialog

This dialog appears when you double click on an event in the event view. It enables you to enter notes against an event- for example, to state what actions were taken to deal with the problem.

Event View Options Dialog

This dialog is used to set the options for the event view.

Show action taken
When this is enabled, the details of actions taken will be displayed on the event view. This does, of course, reduce the number of events that can be displayed at the same time.

Auto save
When this option is checked, all event view settings are saved automatically when you close the event view.

Spreadsheet Options Dialog

This dialog is used to set the options for the spreadsheet view.

Auto save
When this option is checked, all spreadsheet view settings are saved automatically when you close the event view.

Show individual/aggregated readings
When 'Show individual readings' is checked, the spreadsheet view shows each individual reading.

When it is cleared, the computer displays results which are aggregates (min/ max/ average) of the readings for the time interval specified below, and the controls in the 'Show aggregated readings' box are enabled. If you select more than one of average, minimum and maximum, the computer displays the corresponding number of columns for each sensor in the spreadsheet, and adds a heading (max/min/ave) to each column.

Time interval per row
This specifes the time interval between each of the rows on the spreadsheet. If, for example, the logger was set to take a reading every minute, and you set the time interval per row to 60, each row will be the min/max/average of 60 readings.

Chapter 8: How to...

How to configure a system

Setting up a small EnviroMon system is very easy. For more information, or if you have not yet decided upon the configuration, please consult the EnviroMon Equipment help file.

Even if you do not want to use a computer for day to day operation, you will need to connect a computer in order to configure the system.

Before you run the program, here is a checklist of things that you need to do, so that you have all of the information necessary to get the system going. You can use the **Print** button on the **File** menu above to get a paper copy of these instructions.

- draw a plan showing the locations where you wish to place sensors
- mark on it the locations where you want to place converters (each temperature converter can connect to three sensors)
- read the address written in the top right of each converter, and write one of these converter addresses on each converter on the plan

Note: each converter must have a different address. If you have more than one converter with the same address, you must use the 'Change converter address' program to change the address of one of the converters, BEFORE attempting to configure the system.

Write down a table with the following details for each sensor:
- the name of the location
- the minimum and maximum value
- the holdoff time (if any) to allow for defrost cycles
- the converter address of the converter that you wish to connect it to
- the channel number on the converter (1 to 3) that you will use

Choose a sampling interval, as follows:
- divide the maximum number of readingss (15,000) by the number of sensors that you wish to use. 10 sensors will give you a maximum of 1500 samples.
- work out the maximum time between computer downloads. For example, over a week-end would be three days- 3 x 24 x 60 =4320 samples
- Divide the number of samples for the longest time interval (4320) by the maximum number of samples (1500) giving approx 3 minutes.
- Sampling at five minutes would allow a margin for error (bank holidays, forgetting to download the data, etc).

Now you have all of the information available, you are ready to start.

- if possible, connect together the logger, the converters and sensors next to the computer.
- start the EnviroMon for Windows program
- the computer will display the configuration panel

press the Expert button: the configuration expert will guide you through the steps required to set up the system.

How to use multiple loggers

If the loggers are to be connected directly to the computer, or are to be connected via a radio modem link, it is possible to access all of the loggers at the same time, so they can all be part of the same configuration. Just check the 'Use multiple loggers' box, and you can then enter the details for a list of loggers.

For loggers on a telephone link, it is not possible to call all of the loggers at the same time, so it is necessary to create a separate configuration for each logger. Each configuration should have a different data path.

After configuring the first logger, rename the configuration file envimon.ini as (say) leeds.ini. You will find the envimon.ini file in the PICO directory. Next, create a configuration for the next logger and rename the new envimon.ini as (say) brighton.ini. It is then possible to access the two separate configurations by entering either

> emw leeds.ini

or

> emw brighton.ini

How to use a dial-up modem

The EnviroMon logger is designed for easy access via a dial-up modem. The logger connects to one modem using an EL033 modem adapter. The computer connects directly to the other modem. The computer can then call the logger each time the EnviroMon for Windows program is run.

When using a dial-up modem, it is necessary to set the link parameters for the logger so that it will do the following things:

> operate at the maximum data rate supported by the modem (see below)
> enable/disable the modem at times when it should accept calls.

Most modems have an internal buffer, and so it is possible to transfer data from the logger to the modem at full speed (57,600 baud) even if the modem can only send data at lower speed (for example, 14,400 baud) over the telephone link. If you set the logger to operate at 57,600 baud and it does not seem to work, try reducing the data rate to 9,600 baud.

It is also necessary to tell the PC what number to dial to establish a connection to the logger, and to specify whether to keep the link to the logger active until all data is transferred, or until the end of the EnviroMon for Windows session. If the link is kept active after the data is transferred, it is possible to monitor the current readings and to cancel alarms.

We recommend setting up the logger configuration using a direct connection, then changing to modem operation.

To change to modem operation, connect the logger to the modem port and then:

- go into the configuration menu (select File then Configuraton)
- select **Equipment**
- change the connection type to via telephone modem
- change the baud rate to 9600 baud (if required)
- select **Telephone**
- enter the telephone number
- specify whether the computer is to call the logger automatically
- specify any limits on the time that the logger may answer phone calls
- press the **Set Link** button on the logger dialog
- disconnect power from the logger (and remove batteries if fitted)
- reconnect the power, and (if required) check that the logger says BAUD 9600.

How to measure parameters other than temperatures

The EL016 and EL037 voltage converters and the EL036 signal conditioner converter can be used to accept inputs from a wide range of sensors. For sensors that the EnviroMon system does not know about, it is necessary to specify how the voltages from the sensor are to be converted to the parameter to be measured: this process is called scaling. See the Signal conditioner help file for more information.

How to transfer data to other applications

Historical data

If you wish to transfer historical data to another applications, first open a spreadsheet view and select the range of data that you want to transfer then use one of the following methods:

- copy the data into the clipboard and then paste it into another application
- write the data to a file and read the file into the other application

Current data

There are two ways to transfer the current set of values to another application:

- use Dynamic Data Exchange (DDE)
- write the current readings to a file (see CurrentFile parameter in Envimon.ini)

How to connect to a logger via a network

If you have an IP network of computers, you can connect loggers to one or more computers and then access them remotely via the network. You can configure the loggers, monitor current readings and download stored data via the network using EnviroMon for Windows.

To do this, you first install an agent program on each of the remote computers that will be connected to loggers, then run EnviroMon for Windows on the local computer. There are currently agents for the following operating systems:

> Windows 3.11
> Windows 95/98/NT/2000
> Linux (Red Hat 5.2/6)

Before starting, you need to find out the network names of the computers that you wish to connect to. If a computer is called **fred**, you can check that the local computer can talk to them by typing in

> ping fred.

To run an agent program on Windows 95, open a DOS box and type in the following command:

> c:\pico\emagnt32.exe -c2 [-i1051] [-b57600]

-c2 is for COM2. Change the number as appropriate. The parameters in brackets are optional. The -i option sets the IP port number: use 1051 unless that clashes with some other service. The -b option sets the baud rate.

The computer will start the program minimised. If you restore it, it displays a count of IP messages received and of responses from the logger. You can use this to identify problems.

To run an agent program on a Windows 95 computer each time it starts up:

- Click on Start
- Select Settings
- Select Taskbar
- Select Start Menu programs
- Select Add
- Type in the command line c:\pico\emagnt32.exe -c2
- Click on Next
- Select the Startup group

To switch EnviroMon to IP operation:

- go into the configuration menu (select File then Configuraton)
- select **Equipment**
- change the connection type to **IP network**
- Set the IP port number to 1051
- Enter the name of the computer that the logger is connected to
- Press **OK**

You can now use the logger as if it were connected directly to your computer.

Please note that EnviroMon for Windows will request data continuously from the the logger: this may cause a lot of network traffic. To reduce this, set the RefreshDelay parameter in envimon.ini.

See the EnviroMon driver help file for technical information about IP networking.

Chapter 9: Drivers

Introduction

This document describes the Windows drivers for the EnviroMon system. It also provides information about the protocol used to transfer data to an from the logger, for users who wish to write their own drivers.

Windows drivers

There are two versions of the Windows Dynamic Link Library (DLL) for EnviroMon.

- EMW.DLL, is for use in 16-bit applications, for example Visual Basic 3, Excel 5, Borland C 4.52, Visual C 1.5, Delphi 1.
- EMW32.DLL is for use in 32-bit applications, for example Visual Basic 4, 5 etc, Excel 7, Borland C 5, C++ Builder 3 and 4, Visual C 2,3,4,5,6 and Delphi 2, 3, 4.

Please note that the drivers cannot be used at the same time as EnviroMon for Windows. If it is necessary to access the current readings while EMW is running, you should consider using Dynamic Data Exchange (DDE).

Application Program Interface

The application program interface (API) contains the following routines:

- em_open - open the driver
- em_get_sensors - get the number of sensors
- em_get_current - get current readings
- em_close - close the driver

The procedure for using the driver is as follows:

        call em_open
        while you want to get readings,
                call em_get_current
                process the current values
        end while
        call em_close

em_open

void em_open (char * ini_filename)
This routine opens the specified ini file (normally ENVIMON.INI) and sets up a link to each of the loggers listed in the file.
The ini file should have been created and tested using EnviroMon for Windows.

em_close

void em_close (void)

This routine closes down and links to loggers and shuts down the driver.

em_get_sensors

short em_get_current (void)

This routine returns number of sensors.

em_get_current

void em_get_current (short * current)

This routine fills the array 'current' with the current reading for each sensor. The return value is the number of sensors.

The returned values are integers. If the sensor value has two decimal places, a reading of 24.51 will be returned as 2451.

If no data is available, the value will be set to -32767.

C

For Borland and Watcom C, Visual C version 1.5 or lower, use the `implib` program supplied with your compiler to produce an import library emwxx.lib from `emwxx.dll,` where xx = 16 or 32 as appropriate. The command is

```
Implib emwxx.lib emw.dll
```

For Microsoft Visual C versions 2, 4 and 5, Microsoft no longer supply `implib`. Furthermore, the names used in these versions of C are 'decorated'- there is a prefix which indicates how many bytes are transferred to the routine as parameters. As a result, the C names do not match the names in the DLL. The Microsoft tools to 'alias' decorated to undecorated names do not appear to work, so it is therefore necessary to use ordinal linking- linking by number, rather than name. To find the ordinal numbers for the DLL that you are using, type in

```
DUMPBIN /exports emw32.dll
```

The ordinal numbers and decorated names are entered into emw32.def, then the following command generates a lib file:

```
Lib /def:emw32.def
```

Once you have created a lib file, the following steps are then required to use the drivers in your program

include the `emwxx.lib` in your project

Include the file `emwdll.h` in the C source file(s) of your program.

See `emwdltes.c` for an example of a simple Windows program.

C++

C++ programs can access all versions of the driver. If emwdll.h is included in a C++ program, the PREF1 macro expands to **extern "C"**: this disables name-mangling (or decoration, as Microsoft call it), and enables C++ routines to make calls to the driver routines using C headers.

Delphi

`emwpr.dpr` is a complete program which opens the driver and reads values from channel 1.

The file `emwfm.inc` contains a set of procedure prototypes that you can include into your programs.

Excel

The easiest way to get data into Excel is to use the EnviroMon for Windows program, either by using the clipboard, or copying text to a file, or using DDE.

However, you can also write an Excel macro which calls `emwxx.dll` to read in a set of data values. The Excel Macro language is similar to Visual Basic.

The example `emwxx.XLS` reads in the current values from channels 1 and 2 into cells B1..B2.

Use 16-bit driver for Excel version 5, and the 32-bit driver for Excel version 7 and above.

Note that it is usually necessary to copy the .DLL file to your \windows\system directory.

Visual Basic

Version 3 (16 bits)
The DRIVERS\WIN16 sub-directory contains a simple Visual Basic program, `ADC10.mak`.

> EMW16.MAK
> EMW16.FRM

Note that it is usually necessary to copy the .DLL file to your \windows\system directory.

Version 4 and 5 (32 bits)
The DRIVERS\WIN32 sub-directory contains the following files:
> EMW32.VBP
> EMW32.BAS
> EMW32.FRM

LabVIEW

The routines described here were tested using LabVIEW for Windows 95 version 4.0.

While it is possible to access all of the driver routines described earlier, it is easier to use the special Labview access routines if only single readings are required. The adc10.llb library in the `DRIVERS\WIN32` sub-directory shows how to access these routines.

To use these routines, copy `emw.llb` and emw32.dll to your LabVIEW user.lib directory. You will then a sub-vi that demonstrates how to use the driver.

Chapter 10: Troubleshooting & Maintenance

Troubleshooting

Logger won't talk to the computer

This could be caused by

- incorrect port selected on computer
- cable not connected or faulty
- incorrect baud rate setting on logger
- logger is set to print to tally roll printer

To check the baud rate, remove any batteries then disconnect and re-connect the power to the logger. During the start-up sequence, the logger displays the baud rate. This should be 57600 for a direct connection to a computer and 9600 for a modem connection.

If the logger has been set to print to a tally roll printer, connect the printer and wait until the logger prints out a report. As soon as the report is finished, disconnect the printer, connect the logger to the computer and download the new configuration.

Logger won't talk to one or more converters

This could be caused by:
- incorrect logger configuration
- faulty or disconnected cabling
- faulty converter
- faulty logger

See Converter Lights for information on interpreting the flashing light on the converter.

If none of the converters are working, disconnect all of them and connect one converter directly to the logger. If this fails, the logger is probably faulty. If it succeeds, try disconnecting sections of the network until it starts working.

If more than one converter is not working, and all of the malfunctioning converters are all on the same section of the network, replace the converter nearest the logger. If this cures the problem, the converter is faulty, otherwise the network cable leading to the nearest converter is probably faulty.

If just one converter is not working, do the following tests:
- disconnect the network from the logger and connect the malfunctioning converter directly to the logger
- connect another converter at the same location as the malfunctioning converter

Sensor fail or incorrect reading

This could be caused by:
- sensor cable damaged or disconnected
- sensor connector dirty
- interaction with faulty sensor on same converter
- faulty converter

If all of the sensors on one converter are misbehaving, replace the converter with another unit. If this cures the problem, the converter is faulty. If not, disconnect all of the sensors and plug in one sensor at a time.

Note: for this fault, it may take some time for the logger to return to displaying the correct temperature. You can accelerate the process by restarting the logger after connecting each sensor.
If all sensors except one seem to function on their own, re-connect all of the sensors except the one that malfunctions.

Maintenance

Logger

The logger requires little maintenance. If the logger has alkaline batteries fitted, you should replace them annually or after a power outage of more than a couple of hours. Check the battery compartment for signs of leakage.

If you use the audible alarm within the logger, you should test it once per year, by simulating a fault (for example by disconnecting it) on a sensor with alarms enabled.

Converter

For a standard converter, disconnect the unit and inspect the connectors for signs of corrosion and for deposits of dust or debris.

For IP65 converters, check annually inside the box for signs of condensation or corrosion.

If condensation is a problem, it is usually caused by damp air drawn into the box during cooling, and dry air being expelled as the box warms up. This can be eliminated by fitting a PVC breather pipe about a metre long to one of the cable glands.

Remote alarm

Check connectors for signs of corrosion, dust or debris. re-connect the unit and simulate a fault to check the audible alarm is working.

Alarm Dialer

The Menvier dialer loses its telephone numbers and messages if the power goes off. If this happens, the unit will beep every few seconds, and will display a message. If the dialer is not in an occupied area, you should check it daily.

If operation during a mains power failure is required, you should check the battery every three months. First, run the PC software to download all data stored in the logger, then turn off the power to the alarm dialer. The left-hand green light should go off, but the right-hand green light should stay on. The logger should carry on operating as normal. Turn on the mains power again: the left hand green light should come on.

Once a year, you should check that the complete dialer system is working. First, notify all of the contacts that you are about to test the system, and check that they remember how to acknowledge the alarm. Next, simulate a fault by disconnecting a sensor. When the logger alarm starts sounding, one of the red lights on the dialer adapter should come on, and the dialer should start making calls.

Sensors

Check annually for signs of corrosion on the sensor, or for a build-up of debris on the connector.

Calibration

There are several levels of calibration:
- Calibration by a nationally accredited test house (eg NAMAS in the UK)
- Calibration using equipment calibrated against National Standards
- Comparison against other equipment as a 'sanity check'

Calibration by a nationally accredited test house is necessary only if there is some legal, regulatory or technical reason for doing so. For example, a company that manufactures gas meters might be required to prove that the meters were calibrated at a particular temperature.

Calibration using equipment calibrated against national standards is the most common option. This can be carried out by a test house, the manufacturer or distributor, or by the user if the required equipment is available.

The 'sanity check' test should be carried out by the user at intervals determined by the application, the hostility of the environment and the importance of accurate readings.

Unless the tests are carried out by Pico, the converter and sensor should be tested together.

Temperature sensor

EnviroMon temperature sensors are supplied sealed in stainless steel tubes, and are largely unaffected by their environment.

If the temperature is cycled repeatedly while the sensor is immersed or in a damp environment, small amounts of water may be drawn into the sensor: this may cause a rapid increase in the measured temperature.

If low or medium temperature sensors are exposed to high temperatures (greater than 120C), the temperature reading may be permanently affected.

Calibration or checking using ice and/or boiling water is not recommended unless the user has a lot of experience with the required procedures. EnviroMon sensors can be compared with a calibrated reference sensor in any of the following ways:

- insert both sensors in a bath of liquid which is being stirred continuously
- insert both sensors into a large block of metal which is insulated from its surroundings
- bind the two sensors together (with sellotape or elastic bands) then wrap both sensors and some of the cable in several layers of bubble wrap.

Humidity sensor

Humidity sensors contain a sensor element that absorbs both water and other chemicals. The sensor element may quickly become inaccurate if it is exposed to chemicals.

Humidity is very strongly affected by temperature: a 1C change difference in temperature between two sensors will produce a 2.5% difference in humidity reading.

It is therefore important to take the following precautions when calibrating:
- use a sealed container that is a small as possible
- keep the air inside the container moving, but mount the fan motor outside the box
- insulate the container from conducted and from radiated head sources.

Humidity sensors can be checked by
- comparing with a calibrated reference sensor
- measuring the humidity above a saturated solution of a salt (salt cell)

The two most commonly used salts are Lithium Chloride (11.3%) and Sodium Choride (75.3%). These two are preferred because the relative humidity for these two salts is virtually constant over a wide temperature range, however you should note that Lithium Chloride undergoes a state change below 18C, and calibration should be done above this temperature. Please study the safety information (available from a chemical supplier) before considering using Lithium Chloride.

Logger

Loggers do not require re-calibration.

Converter

Converters contain no adjustable parts. They are designed for high reliablilty, and contain built-in components to allow for changes over time, variations due to temperature etc.

Chapter 11: File formats, etc

EnviroMon file formats

Program files

The following program files make up EnviroMon for Windows:
- emw.exe - main program file
- emw???.dll - language-specific information: ???=044 for English
- emw???.hlp - help file: ??? for english

EnviroMon for Windows makes no changes to any files in the Windows directory or the registry, nor does it require any installed drivers.

envimon.ini

The majority of configuration information is held in a file called envimon.ini. If multiple configurations are required, this can be done by putting each configuration in a separate file, then specifying on the command line which file to use. For example, to use the oxford.ini file, the command line is

    emw oxford.ini

Note that, for multiple configurations, the data path must be different for each configuration.

The detailed information below is intended for information only. Where possible, we recommend using the EnviroMon for Windows program to make changes to the settings.

Envimon.ini contains the following sections:

- [Loggerx] - Details of a logger, x = logger number
- [Loggerx, Converter y] - Details of a converter, x = logger y = converter
- [General] - General information
- [Holdoff] - Details of current holdoffs
- [Events] - Details of active events
- [Graph1] - Details of current graph
- [Spread1] - Details for current spreadsheet
- [EventView1] - Details of the event view
- [Temperature] - Temperature display information
- [Alarm] - Alarm options
- [Site] - Site information
- [Preferences] - Colours etc

[General]

NoOfLoggers=1
The number of loggers in this configuration

NoOfSensors=10
The number of sensors in this configuration

Configured=Yes
Set to Yes once the system is configured: until then, the EnviroMon program goes straight to the configuration menu.

DataPath=d:\pico\envimon\
This specifies where data is to be stored

BackupPath=a:\
This specifies where a backup copy of data is to be stored

AutoBackup=Yes
This specifies whether the program should automatically create a new backup file each time you exit the program

Session=0
This specifies how the EnviroMon for Windows program operates the link to the logger. It is important when operating a telephone link, as it is usually desirable to remain connected for as short a period as possible.
    0 - connect at start-up and remain connected
    1 - connect at start-up and disconnect once data is transferred
    2 - do not connect at start-up

DeleteAfter=0

This specifies how long data files are to be retained for. The options are:
>0 - indefinitely
>1 - a month
>2 - three months
>3 - a year

MinutesPerReading=10
The time interval, in minutes, between readings

SampleMode=0
Indicates how to take readings
>0 - when the logger memory is full, wrap
>1 - when the logger memory is full, stop
>2 - stop when max-readings samples have been recorded

MaxReadings=1000
The number of readings to take when SampleMode is zero.

CurrentFile=
If you specify a filename here, EnviroMon will write the current readings to a text file with this name, every sample interval. This can be used to transfer the data to another application. For example:
>CurrentFile=Current.txt

Footer=
If you wish to replace the footer on reports with text of your own, you can add this parameter, specifying an alternative footer. For example:
>Footer=Joe's frozen foods

RefreshDelay=0
When accessing the logger via an IP network, you can reduce network traffic by setting this parameter. It sets the time delay, in seconds, between monitor updates.
A value of 60 would mean that the monitor display would be update only once per minute.

[Holdoff]
[Events]
Do not change these two sections

[Loggerx]
There is one Loggerx section for each logger: x is the logger number.

Connection=0
This specifies how the logger is connected to the computer.
>0 - direct
>1 - via radio modem
>2 - via telephone modem

BaudRate=9600
If present, this over-rides the speed of the link to the logger.

Port=1
For direct connections ,this specifies which serial port the logger is connected to. For network connections, it is the IP port number.

Server=fermi
This is the name of the computer that is connected to the logger, when using IP networking to access the logger

Telephone=01584-823263
This is the telephone number to dial when the connection type 2 is telephone modem

Address=1
This is the logger address. It is 1 for direct and telephone loggers, but must be a different number for each logger connected by radio modem.

Printer=0
This specifes the type of printer connected to the logger. The options are:
    0 - no printer
    1 - Epson FX100
    2 - Datac tally-roll

PrintCurrent=No
 This specifies whether the current values are to be printed at specified intervals

PrintSummary=No
This specifies whether a summary report (min/max/average) is to be printed at specified interval

CurrentMinutes=60
This is the time interval, in minutes, between print-outs of the current values.

SummaryMinutes=1440
This is the time interval, in minutes, between print-outs of the summary report.

MainsFailMinutes=5
NetFailMinutes=5
NoOfConverters=7

AnswerStart=1260
AnswerEnd=1320
These specify the time range (in decimal minutes- 1260 means 21:00) during which the logger will enable a modem to answer telephone calls.

DialerPresent=No
This indicates whether the EL018 dialer/battery backup module is connected. If so, the logger is unable to detect mains failure, as it is not connected directly to the mains adapter.

[Logger1, Converter1]
There is one entry like this for every converter in the system. It contains the information that appears in the converter list.
Address=5
The converter address
Type=4
The converter type

# [Sensor1]
Name=Box
The sensor name is displayed by the logger and appears on reports

Logger=1
The logger that this sensor is connected to

Converter=12
The address of the converter that this sensor is connected to

Channel=1
The channel on the converter for this sensor

Active=Yes
This is Yes while the sensor remains in use, and is set to No when the sensor is no longer required.

ConverterType=2
This is the type of converter

Type=0
This is the type of sensor- see the scaling dialog for more details (0 = default)

AlarmEnabled=No
This is Yes if the alarm is enabled for this sensor

Minimum=-2000
This is the minimum threshold for alarms

Maximum=7000
This is the maximum threshold for alarms

Holdoff=0
This is the holdoff period in minutes for the alarm

[Graph1]
[Spread1]
[EventView1]

These sections contain information about the current views. If a particular view is causing problems, it may be worth while erasing the corresponding section of the INI file.

# [Alarm]
Hysteresis=50
This controls the amount of hysteresis used for alarms. See the Alarm dialog for a detailed description.

Latch=No
This specifes whether the alarm should continue to sound until the user cancels the alarm, even if the alarm condition goes away in the meantime.

# [Site]
Name=Fresher Foods Limited
Maintenance= Iceline Refrigiration Ltd 01116-212405
This information appears on graphs and spreadsheets.

# [Preferences]
Colour7=8421376
Colour8=8388863
Colour9=12632256
This specifies the colours of traces for the graph.

.RDG files

Each time the computer connects to the logger, it transfers any new readings from the logger and saves them in a reading (.RDG) file. The filename is a hex date code (see below) containing the date and time of the most recent addition to the file.

The computer adds the data to the most recent file UNLESS one of the following conditions apply:
- the data file would exceed 64k bytes
- the settings have changed since the last data was transferred
- the values span a month end.

The last rule is so that, if required, it is possible to dispose of data files after a certain period of time (say three months).

When new data is received, the current data file is replaced by a new file which contains both the existing data and the new data. When the current data file is full, or at the start of a new month, the program creates a new file.

The file contains the following components:
- a reading header record
- a list of the sensor numbers stored in this file
- the reading data

Reading header record

```
typedef struct
  {
  UNS16 version;
  UNS16 no_of_readings;
  UNS16 no_of_sensors;
  UNS32 gmt_start;
  UNS32 gmt_end;
  UNS16 minutes_per_reading;
  UNS8  spare [40];
  } READING_HEADER;
```

Sensor numbers

This is a list of the sensor numbers for which data is recorded. There is a 16-bit value for each sensor. If, for example, the file contains data for sensors 1, 3 and 4 (sensor 2 is disabled), reading_header.no_of_sensors would be set to 3, and the sensor number list would contain 1, 3 and 4. There would be three sensor reading entries for each reading.

Reading data

```
typedef struct
  {
  INT16      temperature;
  UNS8       status;
```

} SENSOR_READING;

Each reading is made up of a block of 3-byte SENSOR_READING records, one for each entry in the sensor number table.

Date/time code

The date/time code is made up of the time, in minutes, and the day number. Day 1 is the 1st January 1980.

Date/time code = day number * 1440 + time

EMWEVENT.LOG

This file contains details of the events that have occurred since the log was created (parameters out of range, equipment failures, etc).

This is a convenient method of transferring the current set of readings to other applications. Data is transferred approximately once per second.
Data items are identified by three keywords- Application, Topic and Item. The keywords accepted by EnviroMon are:

Application	EMW
Topic	Current
Item	Name - parameter name
	Value - the current value
	Units - the units
	Alarm - the alarm status

Each DDE request returns a list of values for each parameter.
To read the current values into Excel, type the following command into a spreadsheet cell:
=EMW|Current!Value
To read the current values into Quattro Pro, type in the following command into a cell:
@DDELINK([EMW|Current]Value)
Most application programming languages (C, Delphi, Visual Basic) provide tools to make DDE requests from other applications.

Chapter 12: Communication protocols

IP network operation

If two computers are connected using an IP network (ethernet, dial-up or whatever), it is possible to connect a logger to one computer and then access it from the other.

It is necessary to run an Agent program on the computer connected to the logger. Agents are available for all versions of Windows, and for Linux. See the EnviroMon for Windows help file for information about setting up a logger in this way.

Once the logger is configured and the agent is running, any number of other computers can then access the logger- either using EnviroMon, or accessing the logger directly. The program emclient.c demonstrates how to do this.

The agent accepts a UDP message that contains a header, followed by a normal EnviroMon serial protocol message. The header contains the following information:

```
typedef enum {
  SF_VERSION,
  SF_FORWARD
  } SKT_FUNCTION;


typedef struct
  {
  unsigned short function;
  unsigned short sequence;
  unsigned short timeout;
  } SKT_HEADER;
```

- **function** must be SF_FORWARD.
- **sequence** is a unique sequence number for each request. The response will contain the same sequence number. This gives protection against lost, delayed or transposed packets.
- **timeout** is the time in milliseconds to wait for any response, before giving up.For everything except configuration messages, 500ms is sufficient.

EnviroMon Logger protocol

The computer normally uses 57,600 baud for a direct link to a logger, and at 9,600 over a modem link.

Data is transmitted with 8 data bits, two stop bits, no parity. No flow control lines are used.

All messages to and from the logger have the following format:

Byte	Name	Usage
1	length	This is the total length of the message, including 3-byte header and 1-byte checksum. The maximum message length is 254 bytes.
2	address	This normally 1, unless you are using several loggers on a multi-logger radio modem network
3	function	0 LF_GET_BLOCK 19 LF_GET_READING_VALUES Other functions are available.
4	Data byte 1	This is the data part of the message
...	...	
4+n-1	Data byte n	
4+n	checksum	Calculate the SUM of all preceding bytes Checksum is (0xDE - SUM)

The computer sends a request to the logger, and then the logger sends a response (for most functions, within 200ms).

Get Block

When the computer wants to get a block of data from the logger, it sends an LF_GET_BLOCK request.
An LF_GET_BLOCK request contains two bytes of data:

Byte	Name	Uage
1	Block ID	0 - LB_VERSION 3 - LB_CURRENT 4 - LB_NO_OF_READINGS 10 - LB_FIRST_READING 11 - LB_MAX_READINGS 14 - LB_ALARM_ACTIVE
2	Section number	You probably won't need this... We can supply more information if required.

The data part of an LF_GET_READING response for an LB_CURRENT request is as follows:

Byte	Name	Usage
1	value 1 msb	most significant (upper) byte of current reading for sensor 1
2	value 1 lsb	least significant (lower) byte of current reading for sensor 1
3, 4	value 2	current reading for sensor 2
5, 6	value 3	current reading for sensor 3
...	....	

The data part of an LF_GET_BLOCK response for an LB_ALARM_ACTIVE request is as follows:

Byte	Name	Usage

1	alarm 1	Alarm status for sensor 1
		    0 - alarm off
		    1 - alarm on

2	alarm 2	Alarm status for sensor 2
3	alarm 3	Alarm status for sensor 3
...	....	

Get readings
Before attempting to get stored readings from the logger, it is necessary to read the following three blocks:

> LB_NO_OF_READINGS
> LB_FIRST_READING
> LB_MAX_READINGS

If a logger is configured for three sensors, an is left running for an hour collecting one reading every 5 minutes, these values will be as follows:
> No of readings = 12
> First reading = 0
> Max readings = 5000

If it is left until 6000 readings have been collected, the values will be
> No of readings = 5000
> First reading = 1000
> Max readings = 5000

The reading buffer contains 15,000 two-byte values. Numbers below -32511 are error codes: numbers between -32511 and 32767 are data values.

The reading buffer is accessed by asking for a sequence of values from the buffer. You can ask for up to 125 values to be returned at once: this improves the data transfer rate. After 6000 readings have been taken, the buffer will contain the following values:

Value number	Reading number	Channel number
0	4001	1
1	4001	2
2	4001	3
3	4002	1
..		
2996	4998	3
2997	5000	1
2998	5000	2
2999	5000	3

3000	1	1
3001	1	2
3002	1	3
3003	2	1
3004	2	2
..		
14995	3999	2
14996	3999	3
14997	4000	1
14998	4000	2
14999	4000	3

The reading request contains the following data:

Byte	Name	Usage
1	value no msb	most significant (upper) byte of value no
2	value no	
3	value no	
4	value no lsb	least significant (lower) byte of value no
3	no of values	number of values to send

To get the values for 3 channels for the oldest five readings,
        value no = 1000 x 3 = 3000
        no of values = 5 x 3 = 15

The response would contain the following data:

Byte	Name	Usage
1	value 3000 msb	value for reading 1 channel 1
2	value 3000 lsb	
3,4	value 3001	value for reading 1 channel 2
5,6	value 3002	value for reading 1 channel 3
7,8	value 3003	value for reading 2 channel 1
9,10	value 3004	value for reading 2 channel 1
..		
29,30	value 3015	value for reading 5 channel 3

Messages

Logger messages

Logger start-up sequence

When the logger is first powered on, it displays the following messages

Selftest...

EnviroMon EL008
V14 03/10/98

Batch RMH48
Addr 1 Baud57600

The first message appears a couple of seconds after the logger powers up. The logger then carries out an internal self-test.

The second message tells you the software version (14) and the software date (03/10/98).

The final message tells you the logger batch number (RMH48), its address (1) and the baud rate for the serial link to the computer (57600).

If the logger displays no messages at all, or says ROM fail or RAM fail, the logger should be returned to Pico for repair.

There are several other messages which may appear at start-up:

Unit details corrupt

This message means that the batch number and computer link settings are not set or have become damaged. You can re-program the unit details, using the Program button on the logger configuration panel

Logger not configured
This message means either that the logger has never been configured, or that the configuration has become corrupt. You can use the Program button on the configuration panel to rewrite the configuration. If this happens repeatedly, return the logger to Pico for investigation.

Time not set
This means that the logger's built-in clock has not been set since the logger was powered up. You can set the clock using the buttons on the logger (see the day to day guide for instructions), or by accessing the logger from the computer.

Once the logger is running, you may see the following messages:

XXXXXXXXXXXX
21.25 degC

This message is showing you the current reading(21.25) for sensor XXXXXXXXXX.

21.22 > 20.00
The temperature (21.22) is below the minimum limit (20.00). If this condition continues for at least one sample time longer than the holdoff period, the alarm will sound.

15.25 < 20.00
The temperature (15.25) is above the maximum limit (20.00). If this condition continues for at least one sample time longer than the holdoff period, the alarm will sound.

Converter fail
This indicates that the logger cannot talk to the converter. See troubleshooting for information on how to identify the cause.

Sensor fail
This indicates that there is a problem with the sensor, or the temperature is out of the valid range for this type of sensor. See troubleshooting for information on how to identify the cause.

Active 02:05
This indicates how long the previously-displayed fault has been active- in this case, two hours and five minutes.

Computer messages

Logger not found
This message indicates that the computer could not make contact with the logger. See Troubleshooting

Logger configuration appears to be incorrect
This message indicates that the logger configuration is not the same as the configuration in the computer. If you have more than one logger, check that you have connected the correct logger, and that you are using the correct settings in the computer. You can prevent this message from recurring by re-writing the logger configuration. (press Program in the configuration panel).

Operation failed
If the dialog box also says Get Logger Version, this message indicates that the computer could not make contact with the logger. See Troubleshooting.

If the dialog box also says Halt the Logger, you will probably find that the operation will succeed if you try again straight away.

If the dialog says Write Text, contact Pico for a computer software upgrade. Alternatively, shorten all of your sensor names 15 characters or less.

Converter lights

When a converter is first connected to the network, or the logger is first powered up, the light on the converter starts flashing approximately four times per second.

When the converter receives a message of any kind from the logger, the light stops flashing.

Once the logger is configured and starts asking for readings from the converters, the light will flash three times (EL001) or twice (EL026) every four or five seconds.